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ABSTRACT

Based on findings from the Health Examination Survey of 1963-65, estimates were reported on the prevalence of abnormal conditions of the ear, nose, and throat and the relation of these various abnormalities to hearing sensitivity of noninstitutionalized children aged 6 to 11 years old in the United States. A total of 7,119 children participated in the examination and were thought to be closely representative of the child population from which they were drawn with respect to age, sex, race, region, and other available demographic and socioeconomic variables. Major findings were reported to include: from the otoscopic examination, approximately 20% of the children were found to have some abnormality in at least one of their eardrums; enlarged tonsils touching at the midline were found among more than 1% of the children; one child in five was found to have some obstruction or defect of the nose; and children with abnormalities of their eardrums were found to have reduced hearing sensitivity, on the average, at all the test frequencies. Comparison of the results with a 1958-60 study among Pittsburgh, Pennsylvania, school children 5 to 14 years of age was made. The majority of the report consisted of 31 detailed tables of statistical data. (CB)

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VITAL and HEALTH STATISTICS
DATA FROM THE NATIONAL HEALTH SURVEY
Series 11 - Number 114

EC 042 350

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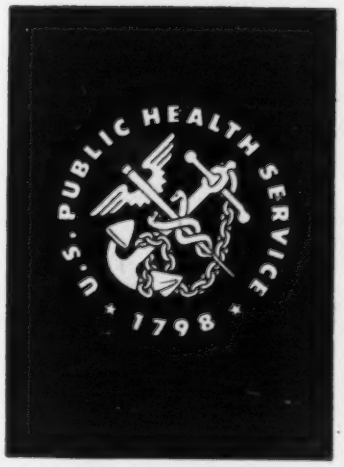
Hearing Sensitivity and Related Medical Findings Among Children

United States

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
Public Health Service
Health Services and Mental Health Administration

Series 11 reports present findings from the National Health Examination Survey, which obtains data through direct examination, tests, and measurements of samples of the U.S. population. Reports 1 through 38 relate to the adult program; additional reports concerning this program will be forthcoming and will be numbered consecutively. The present report is one of a number of reports of findings from the children and youth programs, Cycles II and III of the Health Examination Survey. These reports, emanating from the same survey mechanism, are being published in Series 11 but are numbered consecutively beginning with 101. It is hoped this will guide users to the data in which they are interested.



Vital and Health Statistics-Series 11-No. 114

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Data from the
NATIONAL HEALTH SURVEY

Series 11
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Hearing Sensitivity
and Related Medical Findings Among Children

United States

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The prevalence of ear, nose, and throat abnormalities and the relation of these as well as events in the medical history to hearing sensitivity of children 6-11 years, by age and sex.

DHEW Publication No. (HSM) 72-1046

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service

Health Services and Mental Health Administration
National Center for Health Statistics

Rockville, Md. March 1972

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COOPERATION OF THE BUREAU OF THE CENSUS

In accordance with specifications established by the National Health Survey, the Bureau of the Census, under a contractual agreement, participated in the design and selection of the sample, and carried out the first stage of the field interviewing and certain parts of the statistical processing.

Vital and Health Statistics-Series 11-No. 114

DHEW Publication No. (HSM) 72-1046

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HEARING SENSITIVITY

AND RELATED MEDICAL FINDINGS AMONG CHILDREN

Jean Roberts and John V. Federico, M.D., Division of Health Examination Statistics

INTRODUCTION

This report contains national estimates of the prevalence of ear, nose, and throat abnormalities as well as the relation of these conditions to hearing sensitivity and events in the medical history among children 6-11 years of age as determined in the Health Examination Survey of 1963-65.

The Health Examination Survey is one of the major programs of the National Center for Health Statistics, authorized under the National Health Survey Act of 1956 by the 84th Congress as a continuing Public Health Service function to determine the health status of the population.

Three different survey programs are used in the National Health Survey.[1] The Health Interview Survey, collecting health information from samples of people by household interview, is focused primarily on the impact of illness and disability within various population groups. The Health Resources Program obtains health data as well as health resource and utilization information through surveys of hospitals, nursing homes and other resident institutions, and the entire range of personnel in the health occupations. The Health Examination Survey, from which data in this report were obtained, collects health data by direct physical examination, tests, and measurements performed on samples of the population. The latter program provides the best way of obtaining actual diagnostic data on the prevalence of certain medically defined illnesses. It is the only way to secure information on unrecognized and undiagnosed conditions and on a variety of physical, physiological, and psychological measures within the population. It also collects demographic and socioeconomic data on the sample population under study to which the examination findings may be related.

The Health Examination Survey is organized as a series of separate programs or cycles each of which is limited to some specific segment of the U.S. population and to specific aspects of health. From data collected during the first cycle, the prevalence of certain chronic diseases and the distribution of various physical and physiological measures were determined among a defined adult population as previously described.[2,3]

For the second cycle or program on which this report is based, a probability sample of the noninstitutionalized children 6-11 years of age in the United States was selected and examined. The examination primarily assessed health factors related to growth and development. It included an examination by a pediatrician and by a dentist, tests administered by a psychologist, and a variety of tests and measurements by a technician. The survey plan, sample design, examination content, and operation of the survey have been described in a previous report.[4]

Field collection operations for this cycle, started in July 1963, were completed in December 1965. Of the 7,417 selected in the sample, 7,119 children, or 96 percent, were examined. This national sample is closely representative of

the roughly 24 million noninstitutionalized children 6-11 years of age in the United States with respect to age, sex, race, region, size of place of residence, and rate of change in size of place of residence from 1950 to 1960.

During his single visit, each child was given a standardized examination by the examining team in the mobile units specially designed for use in the survey. Prior to this examination, demographic and socioeconomic data on household members as well as medical history, behavioral, and related data on the child to be examined were obtained from his parents. Ancillary data were requested from the school attended by the child including his grade placement, teacher's ratings of his behavior and adjustment, and health problems known to his teacher. A birth certificate for each child was obtained for verification of his age and information related to his condition at birth.

Members of the Subcommittee on Hearing in Children of the Committee on Conservation of Hearing of the American Academy of Ophthalmology and Otolaryngology—Dr. Raymond E. Jordan, Chairman; Dr. Eldon L. Eagles, Executive Director; and others—were the advisers to the Health Examination Survey in the related ear, nose, and throat (ENT) parts of the examination. Dr. Leo Doerfler from the University of Pittsburgh was responsible for training the technicians in testing of hearing and Mr. Kenneth Stewart, also from the University of Pittsburgh, for the instrument calibration and environmental control aspects.

Statistical notes on the survey design, reliability of the data, and sampling and measurement error are shown in appendix I.

EXAMINATION, HISTORY, TESTS

Medical History

At the time of the initial visit to the sample household, the census interviewer left a self-administered medical history form (appendix II) with the parents for each eligible child. These were picked up about a week later by the Health Examination Survey representative who reviewed them and assisted the parent in completing any incomplete or inconsistent entries. There were seven questions on the form directly related to hearing or the condition of the ear.

The staff pediatrician reviewed the medical history in advance of the examination and administered further special examinations in those instances where either the medical history or his initial examination made him suspect the presence of a defect such as a neurological abnormality.

Ear, Nose, and Throat Examination

During the course of the physical examination of each child, a comprehensive examination of the ear, nose, and oral pharynx was performed. The staff examining physician was either a resident or fellow in pediatrics at a university medical center on elective assignment to the National Health Survey for a month or longer. Prior to examining a child, the physician would have reviewed each examinee's medical history and would have become familiar with the child's history with regard to speech, ear pathology including otitis media, or problems related to hearing, as indicated by his parents. Thus the physician, at the time of the examination, was aware if the child was known to have a specific disturbance of the ear, nose, or throat.

The ENT examination itself consisted of an inspection of the external ears, auditory canals, tympanic membranes, anterior nasal cavity, and oral pharynx.

Inspection of the external ears focused on congenital or acquired defects and the presence of scars, adenopathy, or fistulae of the pinna.

The otoscopic examination involved an evaluation of the auditory canals for polyps, exostoses, foreign bodies, and inflammation; and of the tympanic membranes for mobility, dullness, abnormal transparency, opacity, scars, perforations, and exudates. When the canals were either partially or completely blocked by cerumen or cellular debris, no attempt was made to remove the obstruction and the physician indicated that the particular canal was "occluded" and noted the appropriate reason or material causing the occlusion. The forms used for the recording of these findings are shown in appendix II.

At the time of this otoscopic examination, tympanic drum mobility was tested by means of pneumatic otoscopy.

The nose was examined by speculum, with notation made of the presence of turbinate hypertrophy, polyps, septal deviation, foreign body, or obstruction by swollen tissue or exudate. No attempt was made in this or other parts of the ENT examination to delineate whether tissue swelling or exudates were related to an allergic reaction as opposed to another cause. The subtle clinical judgment necessary for the recognition of the former was not possible in the survey with the time limitations and the brief specialized training that could be provided the medical examiners.

The oral pharynx was evaluated by inspection for the presence of cleft palate (repaired or unrepaired), hypertrophic lymphoid tissue on the posterior pharyngeal wall, and postnasal mucopurulent discharge. An evaluation of the adenoid tissue in the nasopharynx and the eustachian tubes was not included because of the time and additional expertise required to perform these more difficult evaluations.

Tonsils were evaluated as to presence or absence, and if present were further graded according to size, employing the following system: Grade I—tonsils present, within the tonsillar pillars; Grade II—present, with tissue extending beyond the boundaries of the tonsillar pillars but not meeting in the midline; Grade III—tonsils greatly enlarged and meeting in the midline.

To insure skillful examinations by the staff physician and standardization of observations among the many different physicians employed during the course of the survey, two specific training methods were employed. Prior to reporting to the field from the medical center at which he was in training, each field examining physician received four half-days of special training, under the supervision of an otolaryngologist, in the specific examination of the ear, nose, and throat to be used in the survey. These sessions included a review of the regional anatomy, refinement of the individual physician's examining skills, and training in the technique of pneumatic otoscopy. In addition, during the first several days of examinations at a location where a new staff physician was in attendance, senior medical advisers of the Health Examination Survey were present to review examination procedures, to perform replicate examinations, and to insure the minimization of interobserver variation in grading and reporting.

Hearing Tests

Hearing thresholds for these children were determined monaurally and individually by trained technicians in an acoustically treated room within a specially constructed trailer in the mobile examining center. The standard pure-tone air-conduction audiometers used for testing at eight frequences—250, 500, 1000, 2000, 3000, 4000, 6000, and 8000 cycles per second (Hertz)—were modified by the insertion of a 30-decibel attenuator so that testing could be done to as low as 40 decibels below audiometric zero (American Standards Association (ASA), 1951) in a stable part of the range of the instrument.[5,6]

Testing was done by technicians who had been specially trained in the use of a modified Hughson-Westlake method in which the tone was first introduced at a 60-decibel (dB) intensity, decreased by 10-dB steps until no response was obtained, then increased 5 dB and dropped 10 dB until the lowest intensity was reached (threshold) at which responses were obtained in 2 out of 3 or 3 out of 5 ascending trials. Frequencies of 3000 and 8000 cycles were omitted for the 6- and 7-year-old children whenever it became apparent that they were too fatigued to give reliable responses. Hence, the national estimates for the younger children at these frequencies will be less reliable than for the others, as previously described.

Performance of the room in attenuating external noise was determined by acoustical surveys conducted under normal test conditions periodically throughout the cycle. These survey findings and further analyses of the test data indicate no real evidence of masking from external noise throughout the test range. Quality of the test results was further controlled by daily and weekly field checks and approximate monthly calibration of the audiometers in the Acoustics Laboratory of the University of Pittsburgh.

Hearing level findings from the survey in this report are presented in terms of the 1951 American Standard for Audiometric Zero. The basis for converting these findings to those in

terms of the 1964 standard reference zero recommended by the International Organization for Standardization and incorporated in the new American standard in 1969 is given in appendix III. The effect of this conversion has been described more specifically in a previous report.[7]

FINDINGS

Medical History

Seven questions directly related to functional hearing and events producing or indicative of abnormal conditions of the ears were included in the self-administered medical history completed by the parents for the examined children. These were events which were considered possibly predictive of eventual hearing impairment.

Trouble hearing.—From the question "Does your child have any trouble hearing?" 4.2 percent, or an estimated 1 million children aged 6-11 years, were considered by their parents to have such a problem (table 1). This is substantially in excess of the less than 1 percent of these children considered to have a hearing handicap on the basis of audiometric test results—those with hearing thresholds 16 decibels or more above (worse than) "normal" (ASA, 1951 audiometric zero) in the range generally considered most essential for speech.[5] There was no consistent trend with age in the prevalence of this problem, as rated by parents.

Boys were more likely than girls to be reported as having trouble hearing, although the difference was not large enough to be statistically significant at the 5-percent probability level. This pattern was found among the younger children only—those 6-8 years. By ages 10 and 11, girls were slightly more likely than boys to have this problem (figure 1). Parent replies to this question may reflect attention ability of the child in addition to any real hearing impairment.

Earaches.—More than one child in four (26.6 percent)—or an estimated 6.3 million children—were reported to have ever had earaches. This condition was substantially more prevalent among girls than boys from 9 years on (figure 2). For boys, the prevalence of reported earaches decreased sharply with increasing age,

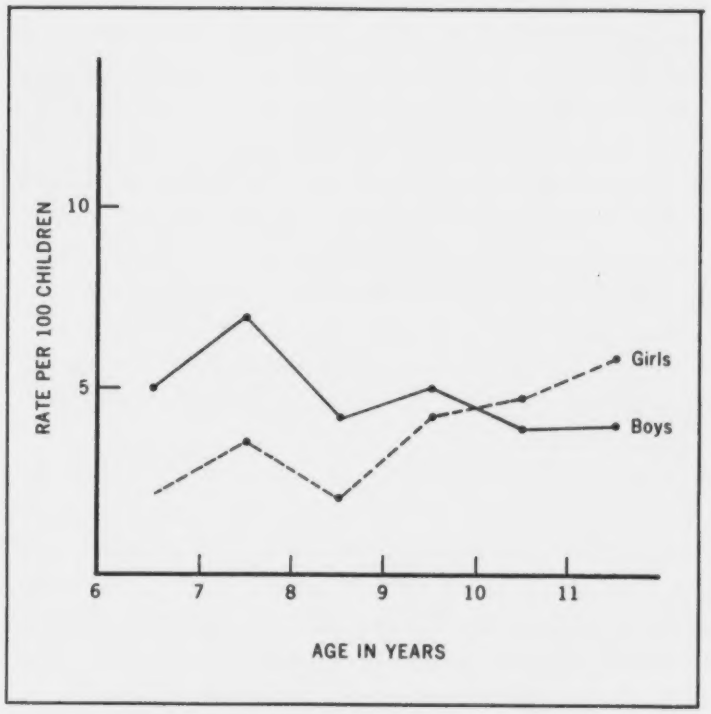

Figure 1. Prevalence of trouble hearing symptoms among U.S. boys and girls aged 6-11 years, by age.

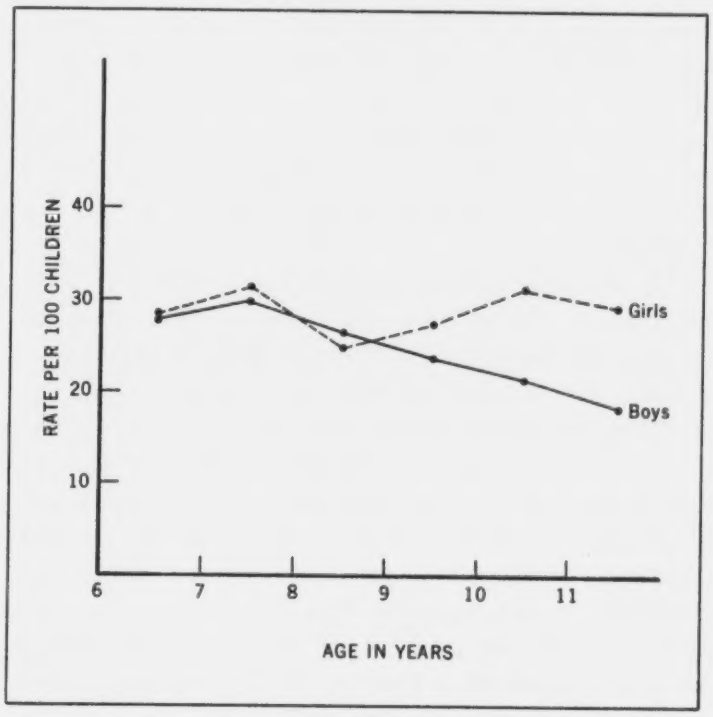

Figure 2. Prevalence of earache symptoms among U.S. boys and girls aged 6-11 years, by age.

from 28 and 30 percent among 6 and 7 year olds to 18 percent among the 11-year-old group.

Injury.—More than 2 percent of children 6-11 years were reported to have ever had injury or

damage to their ears. There was a slight, but not significant, increase in the prevalence of this condition with age. Boys were as likely as girls to have had such an injury.

Drum perforation.—Three percent of these children were reported to have had their eardrums opened or lanced. Boys were slightly, but not significantly so, more likely to have had this happen or done than were girls. No trend by age was evident. In addition, less than 1 percent (0.7 percent) had some type of ear operation other than myringotomy (lancing) of the tympanic membrane.

Running ears.—More than one child out of every 10 (11.8 percent)—or an estimated 2.8 million—were reported to have ever had a running ear or any discharge other than wax from his ear. Boys were about as likely to have such a condition as were girls, and no consistent pattern by age was evident for either group.

Other ear trouble.—Nearly one child in 20 (4.8 percent) was reported to have had some other type of ear trouble than the major conditions indicated above. Girls were about as likely as boys to have such a condition. No consistent age trend was evident.

Examination

National estimates of the prevalence of physical findings indicative of past or present pathology in the ear, nose, and throat among children were obtained from the examination of these regions by the survey staff pediatricians who had been specially trained to identify them, as previously described. No diagnoses of specific disease entities, such as otitis media, were made although estimates are included based on the joint occurrence of those combinations of findings usually associated with more serious chronic or acute pathology. Since cerumen was not removed from the ears, the true prevalence of specific findings will be somewhat underestimated in this study.

External ear.—About 2 percent of children 6-11 years of age had some abnormality of at least one of their external ears. The right ear was as frequently affected as the left (table 2). When such a condition or conditions were found, both ears were somewhat more likely to be affected than just one ear (57 percent compared with 43 percent). The prevalence of such conditions was at essentially the same level for boys and girls throughout the age range in the study.

Most frequently only the pinna or lobe of the ear was affected—65 percent of those with external ear abnormalities. Such conditions were more likely to be of congenital than acquired origin (70 percent congenital). When abnormalities such as adenopathy, fistula, or operative scar were found in the auricular region, they were slightly more likely to be located in the anterior than posterior area.

Auditory canal.—About one child in five (21 percent) was found to have an abnormality in one or both of his auditory canals. For the majority of these (98 percent) the canal was partly or completely occluded, usually with encrusted or impacted cerumen and very infrequently by a foreign body, tumor, polyp, bony exostosis or other anomaly. In rare instances (less than 1 percent of the total group) inflammation from the middle ear had extended into the canal which was not occluded. If the canal was occluded, it was about as likely to be completely as only partially occluded.

When there were abnormal findings in the auditory canal, both canals were somewhat less likely to be affected than just one.

Boys were less likely to have such conditions than girls, the difference in prevalence rates being large enough to be statistically significant at the 5-percent level. The prevalence was found to decrease with age for both boys and girls, probably reflecting the increase in size of the canal with age and hence the ease with which it could be cleaned.

Drum.—Abnormalities of the tympanic membrane or drum were found among about 20 percent or an estimated 4.8 million children, there being no consistent trend with age (figure 3). The right drum was about as likely to be affected as the left (15.0 percent, 15.2 percent) and both were about as likely to be involved as just one drum (47 percent of those with such conditions). An additional 14 percent had at least one of their auditory canals so occluded (usually by ceremen) that otoscopic visualization was not possible.

Boys from 7-11 years were just slightly more likely to have abnormalities in this area than girls; however, the differences were not large enough to be statistically significant.

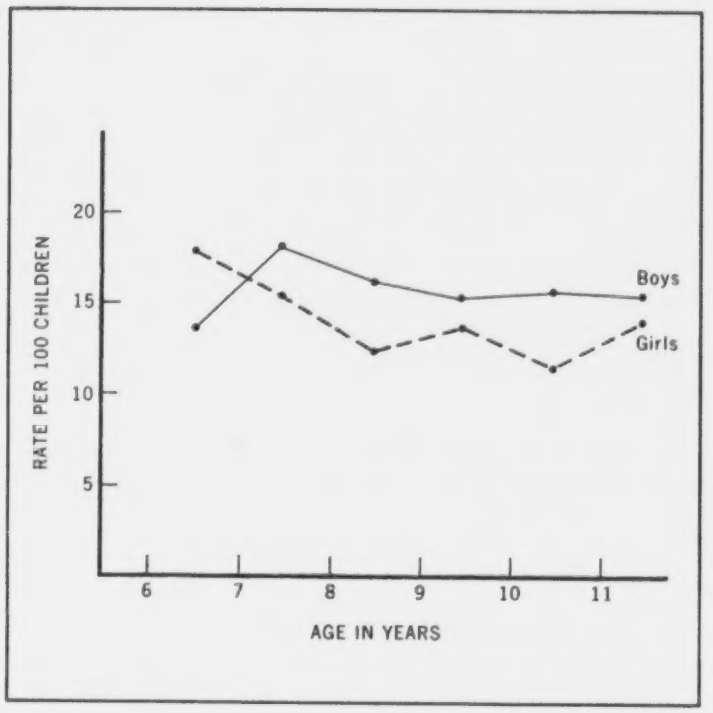

Figure 3. Prevalence of abnormal examination findings in the right ear drum among U.S. boys and girls aged 6-11 years, by age.

Drum lustre.—Nearly 7 percent of these children were found to have drums that were dull in appearance, lacking the degree of lustre typical of the normal tympanic membrane. The right ear was as likely as the left to have such findings and both were slightly more likely to be affected than just one (54 percent). The prevalence of this condition was similar among boys and girls, and no consistent age trend was evident.

Drum transparency.—More than 7 percent of these children (6.2 percent for the right ear, 6.7 percent for the left ear) were rated as having either an abnormally transparent or opaque tympanic membrane in one or both ears. About half of these were rated as opaque or clouded. There was a general increase in these symptoms with age of the child. They were found about as frequently among boys as girls.

Drum-bulging or retracted.—About 9 percent of these children were found to have tympanic membranes that were bulging or retracted indicative of present or past pathology. Both drums were about as likely to be involved as just one.

For the majority of children with this type of abnormality, the drum was retracted (over 96 percent), indicating either latent or early stages of an active disease process. Binaural involvement was found in two out of three cases where at least one of the drums was retracted. Among those with at least one drum retracted, a very low proportion had a bulging membrane in the opposite ear (less than 2 percent).

Less than 1 percent had at least one tympanic membrane that was bulging, a finding suggestive of acute or chronic recurrent otitis media. For these children, the other drum was as likely to be normal as abnormal and, if abnormal, about as likely to be retracted as bulging. The prevalence of active or chronic recurrent disease process as indicated by the bulging condition, however, was so low that these estimates based on it are not as reliable as for the larger group whose drums were retracted.

Drum discolored.—About 2 percent of these children were found to have at least one drum that was discolored—either red indicating active pathology or amber, green, black, or purple, suggestive of a chronic recurrent disease process. The right ear was as likely to be so affected as the left. The discoloration was more likely to be red than some other color (3 out of 4 cases) and more likely to be found in one than both ears (3 out of 4 cases). Where both ears were involved, the discoloration was usually similar in both.

If the drum was bulging or retracted, the membrane was found more likely to be discolored than if the drum was normal—7.2 percent compared with 0.9 percent, respectively. Discoloration was more likely to be present if the drum was bulging (16 percent) than if it was retracted (6 percent).

Drum perforation.—Less than 1 percent of these children (0.3 percent for the right ear and 0.3 percent for the left) were found to have at least one drum that was perforated from a disease process, accident, or operation. This condition was somewhat more likely to be found in one than both ears, though the prevalence is so low that these national estimates cannot be considered reliable. If a perforation did exist, the child was more likely not to have a discharge from it.

Drum scars.—About 2 percent of these children had scars in one or both of their drums from previous spontaneous or induced perforations that had healed. Both ears were less likely to be involved than just one.

Tonsils.—Among noninstitutionalized children 6-11 years of age in the United States, 23.5 percent were found to have had their tonsils removed either completely (13.9 percent) or partially (9.6 percent with tags still present). The proportion who have had this operation increased with age from 17.6 percent at 6 years to 27.8 percent at 11 years (figure 4). The sharpest increase occurred between the seventh and eighth year. Boys were slightly more likely than girls to have had their tonsils removed, but the difference is not large enough to be statistically significant with the size and design of the sample used in this study.

Two out of each five children (41.5 percent) aged 6-11 years were found to have essentially normal tonsils that were confined within the tonsillar pillars. No consistent age trend is evident but the proportion of boys with normal tonsils is significantly lower than that for girls. The higher rates (of normality) for girls persist from age 7 through 11 years.

About one-third of these children (33.9 percent) had tonsils enlarged to the extent that they extended beyond the tonsillar pillars but not so that they were touching in the midline even when the child gagged. Boys were found to have this degree of abnormality about as frequently as girls. The prevalence of this condition decreased with age, except for the 9-year-old group, from 38 percent at 6 years to 28 percent at age 11, either as a result of surgical removal as indicated previously or normal physiological regression (shrinkage) in size of the tonsils with increasing age.

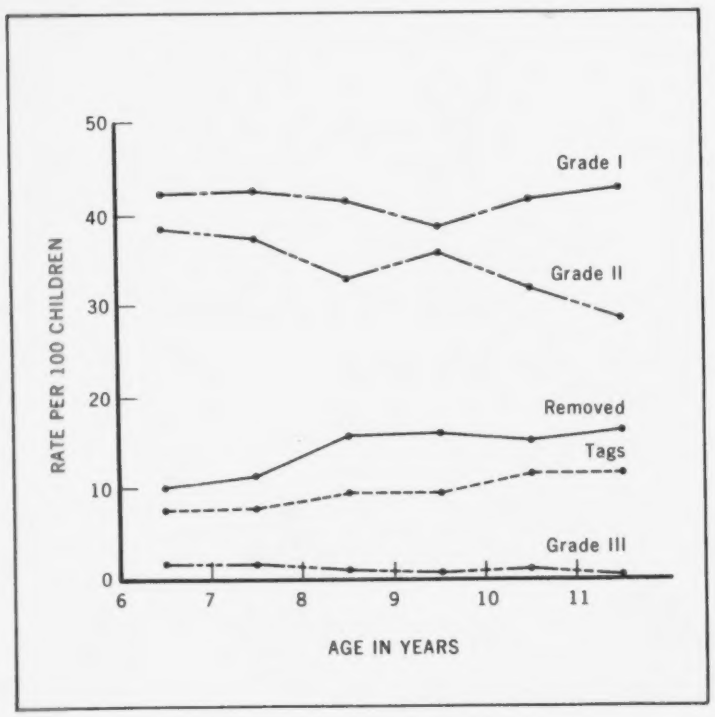

Figure 4. Prevalence of condition of tonsils among U.S. children aged 6-11 years, by age.

Severely enlarged tonsils which touched at the midline were found among more than 1 percent (1.2 percent) of the child population. This degree of pathology was present as frequently among boys as girls and also decreased fairly consistently with age from nearly 2 percent among the 6 year olds to 0.5 percent among those aged 11 years.

Cleft palate.—Less than 1 percent of these children (0.2 percent) 6-11 years of age were found to have a cleft palate. In the majority of cases (over 90 percent of those with such a condition) the defect had been repaired surgically.

Hypertrophic lymphoid tissue.—More than 7 percent had swollen lymphoid tissue on the posterior wall of the pharynx. Boys were as likely as girls to have this condition, frequently associated with an allergy or a common cold. The rates remained essentially invariant with age.

Nose.—About one in five children at the time of the examination had some obstruction or defect of the nose—hypertrophied turbinates (more than 8 percent), or blockage from profuse discharge due either to an allergy or infection (nearly 6 percent), or deviated septum (nearly 3 percent), or another obstruction (1.5 percent). No sex or age differences are evident.

Relation of History and Examination Findings

The relationship of the history of poor hearing or of abnormalities of the ear to findings on the ENT examination among children may be seen in table 3.

Children found on examination to have one or more abnormalities of the drum were significantly more likely to have been reported by their parents to have had trouble hearing, earaches, injury to the ear, the drum opened or lanced, running ears, or other ear trouble than

were those for whom the drum condition was considered normal on examination. Those who had greatly enlarged tonsils or had them removed showed a similar relationship, except that the proportion of this group who had ever had earaches was only slightly higher than expected (figure 5).

The prevalence of perforation of the drum as found by direct examination (0.3 percent), when combined with those found to have tympanic scars (2.0 percent), was only slightly below that reported on the medical history as having had a perforation (3.0 percent). If the difference is not just due to chance, it may indicate that the proportion with such conditions among those whose drums were not visible was slightly higher than for children whose auditory canals were unoccluded, or that the perforation had healed so that the scar was not visible to the examiner.

Relationship Between Hearing Sensitivity, Medical History, and Examination Findings

History.—Only one event in the medical history showed a strong consistent association with hearing levels across all eight test frequencies (tables 4-10). Children reported by their parents to have had trouble hearing had significantly higher (poorer) hearing thresholds in the better ear, on the average, than did those who were said to have had no such trouble (figure 6). This pattern was consistent for both boys and girls across the entire age range.

Children reported to have had earaches and those with a history of running ears showed a similar pattern of poorer hearing than those without such a history. However, at frequencies of 2000 and 3000 cycles the mean differences in the thresholds for the better ear were not large enough to be statistically significant at the 5-percent level.

The relationship to hearing thresholds was less consistent for those children who had injured at least one of their ears or at least one of whose drums had been perforated in an operation, accident, or by other means. Children with such conditions also had hearing thresholds that were higher (poorer) on the average than those who did not. However, these mean differences were large enough to be statistically significant for those with a history of ear injury only at the middle frequencies, 1000-6000 cycles, and for those with a reported perforated drum only at 500, 6000, and 8000 cycles.

Among children whose drum was reported to have been perforated, thresholds were slightly but not significantly lower (better) by 1 or 2 decibels, on the average, if the drum had been opened only once rather than more often; or if opened once or twice rather than three times or more.

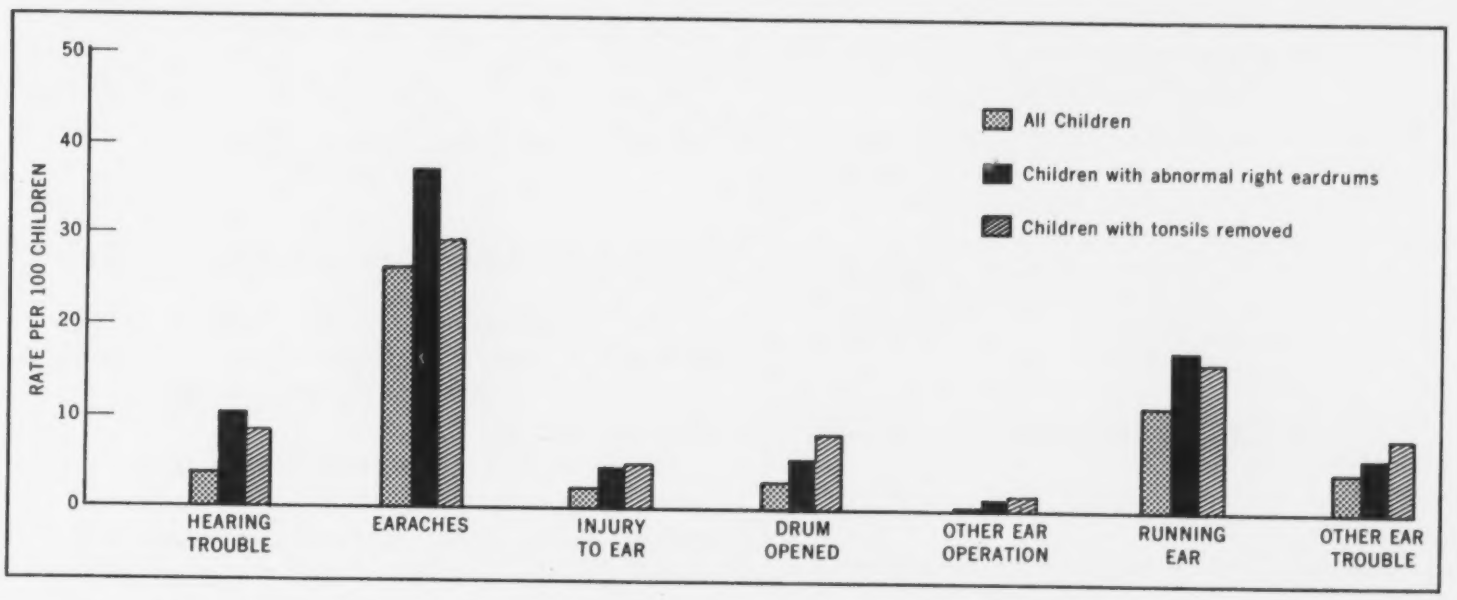

Figure 5. Prevalence of symptoms related to hearing among U.S. children with examination findings of abnormal right ear drum or with tonsils removed and all U.S. children aged 6-11 years.

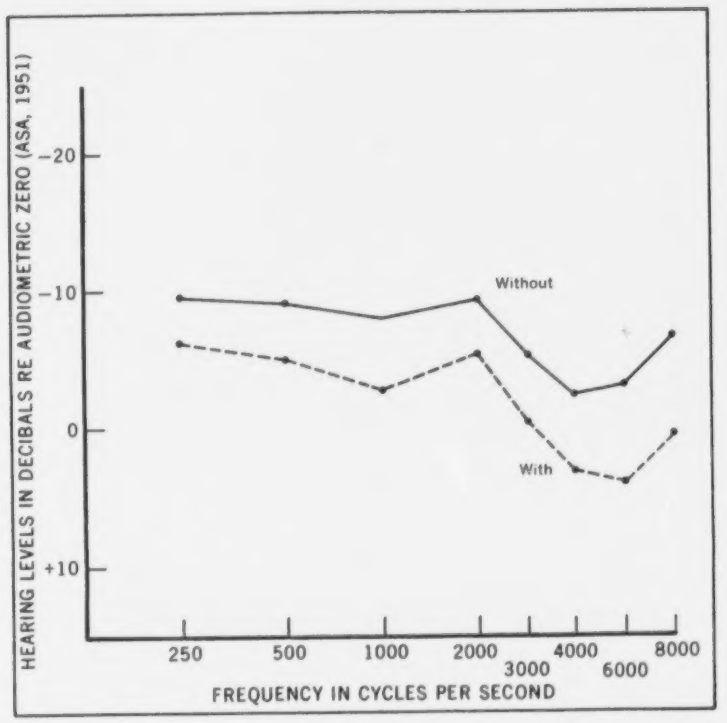

Figure 6. Average hearing levels in the better ear at eight test frequencies for U.S. children aged 6-11 years with and without history of hearing trouble.

Examination.—In analyzing the relationship of the ear, nose, and throat findings indicative of present or past pathology to the hearing levels of children, the specific abnormalities were first considered whether they existed alone or in combination with other conditions. Hearing levels here are related to findings of the respective ear indicated regardless of the condition of the other ear (tables 11-28).

Only five of the specific conditions considered in this examination—all involving the tympanic membrane—showed a strong consistent association with hearing thresholds of these children across all eight test frequencies. The strongest association was found for perforation of the drum, followed by lack of mobility, bulging, scars, and retraction of the drum. Children with such conditions had significantly less sensitive hearing (higher or poorer thresholds) than those whose corresponding ear drum was normal (figure 7). However, mean hearing levels, even for children with these abnormalities, were generally still within the normal range.

Also significantly related to hearing sensitivity were conditions of complete occlusion of the auditory canal (usually by cerumen), lack of visibility of the drum, transparency or opacity of the drum, and discoloration of the drum. Children with these findings had significantly higher (poorer) hearing thresholds on the average than those with normal findings in the respective ear except at 500 and 6000 cycles for those with occlusion, 2000 and 3000 cycles for those with transparency or opacity, and 1000 and 2000 cycles for those with abnormal coloration of the drums where the mean differences were so small they could easily be due to chance alone.

Hearing sensitivity was slightly higher (better hearing) if both ears were otoscopically normal than if only the ear under test was free of pathology. The mean differences, however, were not large enough to be statistically significant at the 5-percent probability level, as shown for frequencies of 1000 and 4000 cycles per second in table 29. Children having any of the types of pathology most closely associated with hearing loss were found to have elevated hearing levels in the affected ear regardless of whether the other ear had the same type of pathology or was otoscopically normal. Where mean differences were found they were neither consistent nor large enough to be considered statistically significant.

Comparison With Findings From the Pittsburgh Study

The 1958-60 study among Pittsburgh, Pennsylvania, school children 5-14 years of age was undertaken as a cooperative effort of the Subcommittee on Hearing in Children of the Committee on Conservation of Hearing of the American Academy of Ophthalmology and Otolaryngology, the Maternal and Child Health Section of the University of Pittsburgh's Graduate School of Public Health, and the Pittsburgh Department of Education. This study served as the prototype for the hearing aspects of the National Health Examination Survey among children.[8]

Methods used for the audiometric testing were essentially identical in the two studies. The acoustical environment in the mobile trailers of the national study was at least as adequate in the attenuation of ambient noise as the stationary locations used in the Pittsburgh study. Some modifications were made in the physical examination of the ear, nose, and throat. Those parts

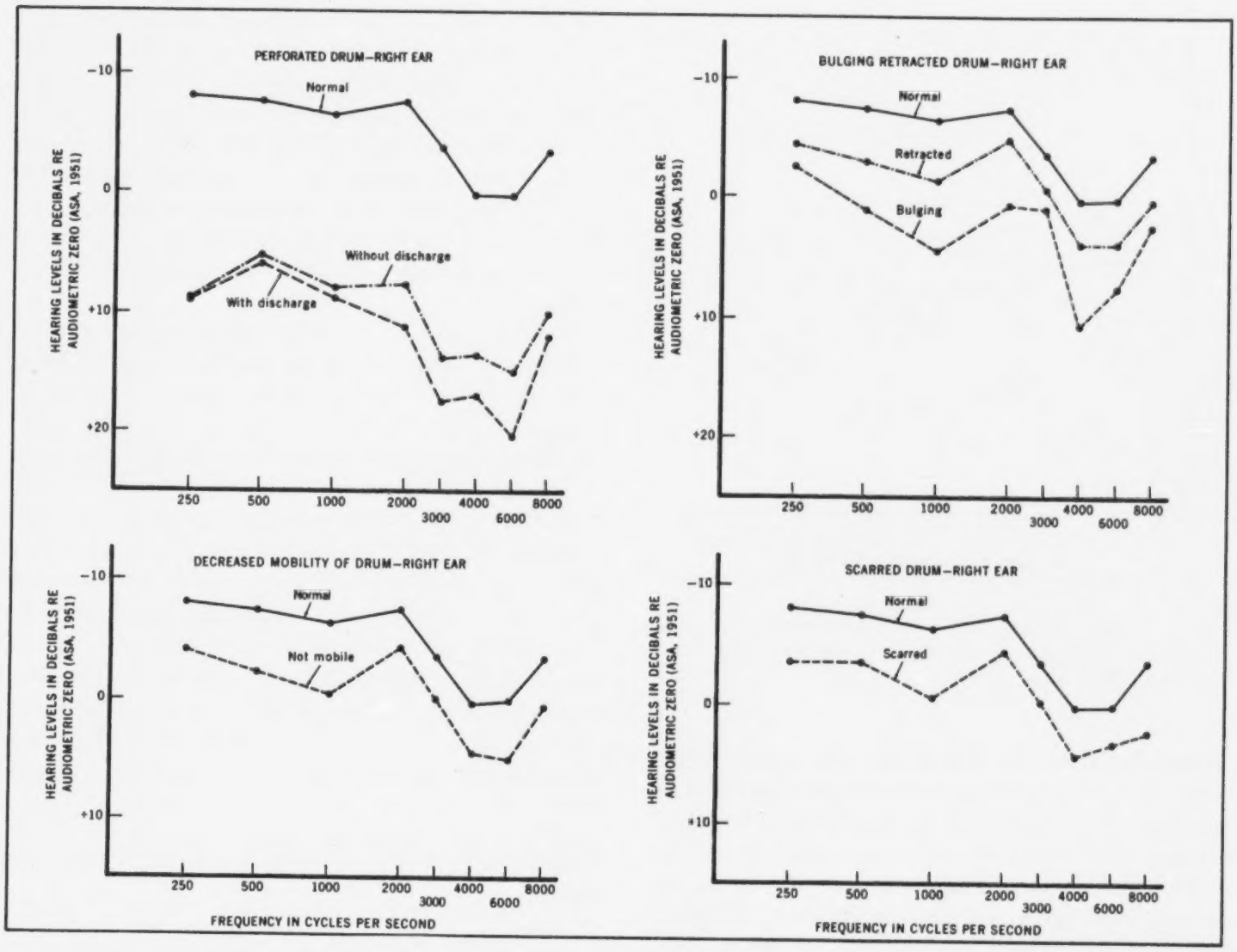

Figure 7. Average hearing levels in the right ear at eight test frequencies for U.S. children with normal and with significant abnormal otoscopic findings.

on which there were the greatest disagreements among the experienced otolaryngologists making the examination in the Pittsburgh study were eliminated from the examination done by the specially trained pediatricians in the national study.

For convenience at this time, comparison is made here between the entire group of children in both studies—those 5-14 years of age in the Pittsburgh group and the national estimates for the noninstitutionalized 6-11 year olds in the present study, recognizing that this factor alone will affect the comparability of the findings where any substantial age-related trend exists in this age span. It is further to be expected that the prevalence of findings associated with upper respiratory infections would be greater in the Pittsburgh group, since examinations there were done throughout the calendar year, than for those in the national study. In the latter, children living in northern areas were not scheduled for examinations during the winter months when the prevalence of such infections is greatest.

The prevalence of otological abnormalities among children in the United States from the present survey and those comparable from the Pittsburgh study are shown in table 30.

In both studies, relatively few defects were found in respect to the external ear, the rate being slightly but not significantly lower among the Pittsburgh group.

About 10 percent of the children in both studies were found to have at least one of their drums not visible for examination, usually because of cerumen. The proportion whose auditory canals were rated as partially occluded was significantly higher in the national study than the Pittsburgh group (8 percent compared with 1 percent), but the proportion considered completely occluded was similar in both.

Abnormalities of the tympanic membrane were relatively few in number in both studies. The most prevalent in both were conditions of retraction, indicative of either acute or chronic middle ear disease. About 6 percent of U.S. children were found to have at least one drum retracted compared with about 9 percent in the Pittsburgh study, a difference large enough to be considered statistically significant at the 5-percent probability level. Conditions of dullness of the tympanic membrane and lack of mobility of the drum were slightly but not significantly more prevalent nationally (6 and 5 percent, respectively, with at least one drum showing this) than among the Pittsburgh children (where the comparable rates were 4 percent).

Substantially less prevalent for all U.S. children were findings of transparency of at least one drum—4 percent compared with 19 percent in Pittsburgh (indicating a possible difference in the basis for rating such a condition in the two studies). Opacities and scars on at least one drum were slightly less frequently found among U.S. children (3 percent and 2 percent, respectively) than those in Pittsburgh (with comparable rates of 5 percent and 4 percent).

Examination findings of the nose indicated a significantly greater prevalence of turbinate hypertrophy due either to an allergy or infection among children from the national study (8 percent) than among those from Pittsburgh (1 percent), while the occurrence of a deviated septum or other obstruction in the nose differed only slightly. Conditions of profuse discharge indicative of an allergy or acute respiratory infection were more prevalent among the Pittsburgh children. However, the proportion with swollen tissue, also indicative of such allergies or infection, was substantially greater in the national study.

Findings regarding the condition of the tonsils will reflect regional differences in the policy regarding their surgical removal as well as the differences in the ages of the children in these two studies. Nearly 14 percent of U.S. children 6-11 years of age had had their tonsils completely removed compared with 25 percent among the Pittsburgh group which was 5-14 years of age. The proportion with tonsillar tags remaining was just slightly greater in the national study (10 percent compared with 7 percent in Pittsburgh). Substantially more of the U.S. children were rated as having normal tonsils than those in Pittsburgh—54 percent compared with 31 percent, respectively—among those whose tonsils had not been removed. Significantly less prevalent throughout the United States than Pittsburgh were findings of enlarged tonsils rated as Grade II or III (46 percent of those with tonsils in the United States compared with 69 percent in Pittsburgh).

The prevalence of abnormalities of the auditory canal in the national study showed a

significant decrease with age while the proportion having had tonsils removed increased. The age-related trends account for a part but not all of the differences in rates from the two studies found for these two conditions. In fact, this age-related trend would make even more striking the discrepancy in rates for enlarged tonsils. For none of the other conditions did the prevalence rates differ more than might be expected through chance alone, and for at least some of these the differences were in the direction expected from the age trend for the condition as found in the national study—drum not visible and discoloration of the drum.

In both studies, only otoscopic findings related principally to the tympanic membrane appear to be associated with hearing sensitivity. Comparison of the hearing sensitivity among U.S. children aged 6-11 years and those from Pittsburgh aged 5-14 years is limited here to five groups on the basis of the findings from the otoscopic examination—one or both ears normal, drum not visible, perforated drum, impaired mobility of drum, or retracted drum (pars tensa or pars flaccida areas). The latter three conditions are considered whether they existed alone or in combination with other abnormalities.

Mean hearing levels for children with these findings from both studies are shown in table 31. In general mean hearing levels for children with at least one ear normal were lower in the national study than in the Pittsburgh group across the seven test frequencies in both studies. Exceptions may be seen only at 250 and 6000 cycles where the differences in mean levels were negligible and at 4000 where hearing among U.S. children was significantly less sensitive.

On the average, children with perforation of the drum had less sensitive hearing than the normal group by 10 to 15 dB in both studies.

Children with at least one drum immobile or retracted were also found to have less sensitive hearing levels, on the average, than the normal group in both studies. However, U.S. children with these conditions generally were found to have somewhat more sensitive hearing than the comparable Pittsburgh group with similar examination findings.

DISCUSSION

The Health Examination Survey among children obtained national data previously unavailable on the prevalence of physical conditions and symptoms of the ear, nose, and throat known to be related to hearing sensitivity or which may be predictive of hearing impairment, and on the extent of these relationships. These findings provide information on the magnitude of some of the problems related to the conservation of hearing in children for use in the development or modification of case-finding programs and essential services.

Previous recent studies of hearing in children have been limited to smaller segments of the population such as that in Pittsburgh, Pennsylvania, by Eagles et al.[8] which served as the prototype for the hearing aspects of the present survey and the Reading, Pennsylvania, study by Wishik et al.[19,20] Others have dealt with more limited aspects of the problem such as Bordley and Hardy[21] who undertook a longitudinal study of lymphoid tissue growth during their research on nasopharyngeal irradiation for the prevention of hearing impairment in a group of Baltimore, Maryland, children who failed an audiometric screening. An earlier study (1931-36) among school children by Ciocco and Palmer of the U.S. Public Health Service[22] produced findings of value also but did not have available for use as accurate testing environment or methods as those used in more recent studies.

Roughly comparable information on the prevalence of abnormal findings in the ear and the relation of these findings to hearing sensitivity among the defined U.S. adult population as determined in the Health Examination Survey of 1960-62 have been described previously.[23] In general, adults with abnormal findings or whose tympanic membranes could not be visualized on otoscopic examination were found to be more likely than those with normal ears to have impaired hearing, similar to the findings among children in the present study.

Certain differences in findings among U.S. children when compared with those from the 1960-62 national survey among adults were to be expected. The fact that the prevalence of tympanic membrane perforations is only one-

half and prevalence of scarring of the drums from previous perforations is less than one-third the corresponding rates among adults may well be attributable both to the relatively recent use of antimicrobials which were not available in childhood to most adults examined in the 1960-62 study and to the resultant decreased need in recent years for and performance of myringotomies in the management of infections involving the middle ear.

Also not unexpected were the findings from the children's examinations of (1) significant relationships between abnormalities of the tympanic membrane and the history of symptoms of trouble hearing, earaches, perforation of the drums, injury to the ears, running ears, or other ear trouble; (2) the significantly higher prevalence of symptoms among those with greatly enlarged tonsils or tonsils removed because they had been infected; and (3) the significantly higher (poorer) hearing thresholds among those with definite abnormalities of the tympanic membrane, such as perforation, decreased mobility, bulging, scarring or retracted drum.

United States children with an abnormality of the auditory canal were, not unexpectedly, more likely to have been reported by their parents to have had "trouble hearing" than those without this finding. Slightly more than one child in seven (15 percent) had an abnormality of the auditory canal as a finding on examination. In a large majority of such instances, the abnormality was either a partial or complete occlusion, usually with encrusted or impacted cerumen.

Hearing sensitivity was found to be related to abnormality of the auditory canal: children with such abnormalities also had significantly higher (poorer) hearing thresholds on the average than those with normal canals at all frequencies tested except 500 cycles per second.

Confirmation of this relationship comes from analyses of other history and finding data. Children whose tympanic membranes were not visualized on otoscopic examination because of occlusion of the auditory canal with cerumen were more likely to have been reported by their parents to have had "trouble hearing" than those whose drums were visible, and found to be normal. And those whose tympanic membranes were not visualized had significantly higher (poorer) hearing thresholds on the average than those whose drums were normal. This cannot be attributed to an abnormality of the drum in each case in which the drum was not visualized, since on the average only 15 percent of the children examined had drum abnormalities. The conclusion can only be that the majority of those whose tympanic membranes were "not visible" had higher (poorer) hearing thresholds solely on the basis of auditory canal occlusion by cerumen.

From these data on abnormalities of the auditory canals and related hearing sensitivities, it would appear that potentially 15 percent, or an estimated 3.6 million, of children aged 6-11 may have some degree of hearing impairment due to occlusion of the auditory canals by cerumen.

Also of interest due to its relatively high, and unexpected, prevalence was the finding that almost one in five, or an estimated 4.7 million, children aged 6-11 years had some obstruction of the nasal passages. Hypertrophied turbinates or blockage from profuse discharge, whether caused by allergy, acute infection, or other condition, were the most common findings. Children with an abnormality of the nasal passages were significantly more likely to have been reported by their parents to have had trouble hearing than those without this finding, and more likely to have been reported to have had earaches, running ears, or other ear trouble. And children with an abnormality of the nasal passage had higher (poorer) hearing thresholds than those with normal findings at all frequencies, although significantly higher only at 1000 and 4000 cycles per second.

SUMMARY

This report presents estimates of the prevalence of abnormal conditions of the ear, nose, and throat and the relation of these various abnormalities to hearing sensitivity of children aged 6-11 years in the United States based on findings from the Health Examination Survey of 1963-65.

In this Health Examination Survey program, a probability sample of 7,417 children was selected to represent the nearly 24 million non-institutionalized children of this age in the United States. Of these, the 7,119, or 96 percent, examined were closely representative of the child population from which they were drawn with respect to age, sex, race, region and other available demographic and socioeconomic variables.

Significant findings from this study include:

1. From the otoscopic examination, about 20 percent or an estimated 4.8 million children aged 6-11 years were found to have some abnormality in at least one of their eardrums. An additional 14 percent, or 3.4 million children, had their auditory canal so occluded, usually by cerumen, that the condition of the drum could not be determined. Both drums were rated as abnormal for 9.7 percent or 2.3 million children, while an additional 10.8 percent had only one abnormal. In this latter group, the other eardrum was more likely to be normal (8.6 percent) than not visible (2.2 percent).

2. Significantly enlarged tonsils touching at the midline were found among more than 1 percent (1.2 percent) of the child population, while nearly one-fourth (23.5 percent) had had their tonsils removed.

3. One child in five at the time of these examinations had some obstruction or defect of the nose most frequently from hypertrophied turbinates or profuse nasal discharge caused by allergy, acute infection, or other condition, and substantially less often from a deviated septum or other obstruction.

4. Children with abnormalities of their eardrums were found to have reduced hearing sensitivity, on the average, at all the test frequencies. However, mean hearing levels, even for children with such abnormalities, were generally still within the normal range. The specific conditions most closely associated with reduced hearing sensitivity were perforation, decreased mobility, bulging, scarring, or retraction of the drum—most of which were indicative of latent or active pathology. Also significantly related to reduced sensitivity at most of the test frequencies but not all were findings of complete occlusion of the auditory canal by cerumen, incomplete visibility of the drum, abnormal transparancy or opacity of the drum, and discoloration of the drum—in general evidence of latent or active pathology. The reduction in hearing sensitivity tended to be somewhat but not significantly greater if the abnormality existed in both than just one ear.

Examination and testing procedures are described.

Comparison is made with the findings from the Pittsburgh study, which served as the prototype for the hearing aspects of the present study. Included also is a description of the ear, nose, and throat examination, the related medical history and the hearing testing methods.

No attempt was made in either study to examine the eustachian tubes or adenoid tissue in the nasopharynx or to distinguish between allergic and infectious conditions.

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Age and sex	Trouble hearing	Earaches	Injury to ear	Drum perforated	Other ear operation	Running ears	Other ear trouble
	Rate per 100 children						
Both sexes							
Total, 6-11 years	4.2	26.6	2.4	3.0	0.7	11.8	4.8
6 years	3.6	28.2	1.1	3.6	*	12.2	5.6
7 years	4.5	30.6	2.7	3.0	*	14.6	4.7
8 years	3.2	25.2	2.2	2.8	*	11.1	5.2
9 years	4.7	25.6	2.9	2.8	*	11.5	4.6
10 years	4.4	26.2	2.4	3.2	*	12.4	4.8
11 years	4.7	23.8	3.1	2.4	*	8.8	4.0
Boys							
Total, 6-11 years	4.7	24.7	2.4	3.3	*	12.1	5.0
6 years	5.0	28.0	1.0	4.2	*	13.1	6.6
7 years	5.2	30.0	3.4	3.4	*	14.9	3.1
8 years	4.4	26.4	2.5	3.0	*	13.2	5.7
9 years	5.0	23.8	2.5	3.2	*	11.0	4.7
10 years	4.2	20.7	1.5	3.3	*	10.7	5.5
11 years	4.3	18.4	3.4	2.3	*	9.3	4.4
Girls							
Total, 6-11 years	3.7	28.6	2.4	2.7	*	11.6	4.6
6 years	2.2	28.4	1.2	3.1	*	11.4	4.7
7 years	3.8	31.1	2.0	2.5	*	14.4	6.3
8 years	2.0	24.1	1.8	2.5	*	9.0	4.6
9 years	4.4	27.4	3.3	2.4	*	12.0	4.4
10 years	4.7	31.7	3.4	3.0	*	14.1	4.0
11 years	5.1	29.3	2.8	2.6	*	8.3	3.7
Standard error, total	0.37	0.82	0.16	0.34	*	0.50	0.30

Table 2. Prevalence rates of ear, nose and throat abnormalities among children 6-11 years of age, by age and sex, with standard errors for total rates: United States, 1963-65

Age and sex	Abnormalities of external ear		Abnormalities of auditory canal		Drum—any abnormality		Drum—dull		Drum—transparent or opaque		Drum—bulging or retracted		Drum—perforated		Drum—discolored	
	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left
Both sexes	Prevalence rates per 100 children															
Total, 6-11 years	1.7	1.7	15.7	15.4	15.0	15.2	5.7	5.6	6.2	6.7	7.1	6.9	0.3	0.3	1.7	1.6
6 years	1.6	1.6	18.2	17.6	15.8	15.4	6.0	5.7	6.0	7.3	8.1	7.8	0.6	0.8	2.0	2.2
7 years	2.0	2.0	15.5	16.6	16.8	16.6	7.2	6.6	6.3	6.5	7.3	7.2	0.5	0.2	2.6	1.9
8 years	1.8	1.6	15.6	15.6	14.2	14.5	5.5	5.2	6.4	6.8	6.2	6.8	0.1	0.4	3.8	1.2
9 years	1.6	1.4	16.2	14.8	14.4	16.2	6.4	6.4	6.4	7.2	6.7	7.0	0.4	0.3	1.6	1.6
10 years	1.6	1.8	14.5	14.2	13.8	13.8	3.8	4.1	5.2	5.5	6.8	6.1	0.2	0.1	0.8	1.1
11 years	1.3	1.5	14.0	13.8	14.8	14.4	5.3	5.1	6.9	6.8	7.6	6.8	0.2	0.3	1.1	1.4
Boys																
Total, 6-11 years	1.6	1.7	14.1	13.1	15.8	16.0	6.0	5.8	6.2	6.7	7.7	7.4	0.3	0.4	1.7	1.8
6 years	1.7	1.6	17.7	15.6	13.9	14.0	5.6	4.6	5.4	6.6	8.0	8.5	0.2	0.8	1.4	2.6
7 years	2.0	2.5	13.4	12.9	18.2	18.5	8.7	8.3	5.8	6.0	7.2	6.4	1.0	0.5	2.0	1.6
8 years	1.7	1.6	13.6	13.5	16.1	15.0	6.6	5.9	6.6	7.5	6.5	6.1	-	0.4	2.5	1.4
9 years	1.4	1.3	14.6	13.3	15.3	17.2	6.4	6.6	6.0	6.9	8.0	8.6	0.4	0.6	1.7	2.2
10 years	1.8	2.0	12.2	11.1	15.8	16.6	4.5	4.9	6.1	6.2	8.0	7.2	-	-	1.3	1.8
11 years	1.0	1.3	12.9	12.4	15.5	14.8	4.3	4.4	7.1	6.9	8.4	7.3	0.3	0.3	1.3	1.1
Girls																
Total, 6-11 years	1.7	1.6	17.3	17.8	14.1	14.3	5.4	5.3	6.1	6.7	6.6	6.5	0.3	0.2	1.6	1.3
6 years	1.5	1.6	18.6	19.7	17.7	16.9	6.5	6.8	6.6	8.0	8.2	7.0	1.1	0.9	2.6	1.9
7 years	2.0	1.6	17.6	20.4	15.3	14.8	5.8	5.0	6.8	7.0	7.4	7.9	-	-	3.2	2.2
8 years	2.0	1.5	17.6	17.7	12.4	14.0	4.4	4.6	5.7	6.1	5.9	7.5	0.2	0.4	1.2	1.0
9 years	1.8	1.5	17.9	16.2	13.5	15.1	6.3	6.2	6.7	7.4	5.4	5.5	0.4	-	1.4	1.0
10 years	1.5	1.6	16.8	17.2	11.5	10.9	3.2	3.3	4.2	4.8	5.6	5.0	0.4	0.2	0.3	0.4
11 years	1.5	1.7	15.2	15.1	14.0	13.9	6.3	5.8	6.7	6.7	6.7	6.2	-	0.2	0.9	1.7
Standard error, total	0.43	0.41	0.86	0.85	1.35	1.36	0.85	0.85	0.86	0.86	1.07	1.05	*	*	0.45	0.45

Table 2. Prevalence rates of ear, nose and throat abnormalities among children 6-11 years of age, by age and sex, with standard errors for total rates: United States, 1963-65—Con.

Drum—scars		Tonsils					Abnormality of oral pharynx	Hypertrophic lymphoid tissue	Abnormality of nose		Right ear occluded			Left ear occluded		
Right	Left	Removed	Tags	Grade I	Grade II	Grade III			Right	Left	Total	Partly	Completely	Total	Partly	Completely
Prevalence rates per 100 children																
1.8	2.0	13.9	9.6	41.5	33.9	1.2	10.0	7.4	19.5	19.5	15.4	7.9	7.5	15.1	8.2	6.9
2.4	2.1	10.0	7.6	42.0	38.4	1.8	10.6	7.5	20.6	21.6	18.0	9.0	8.9	17.3	9.5	7.8
2.1	2.5	10.7	7.8	42.4	37.2	1.7	8.8	6.8	20.4	19.3	15.4	6.9	8.5	16.2	9.0	7.2
1.6	1.9	15.4	9.6	41.6	32.5	1.0	9.7	7.2	21.4	21.4	15.0	8.7	6.3	15.1	7.7	7.3
1.7	2.2	15.9	9.4	38.2	35.6	0.9	11.2	7.8	19.2	20.4	15.7	7.1	8.6	14.5	7.8	6.7
1.2	1.6	15.2	11.2	41.8	30.8	1.0	9.4	6.4	17.9	17.7	14.1	7.7	6.4	13.7	7.0	6.7
1.6	1.6	16.2	11.6	43.5	28.0	0.5	10.1	8.5	17.3	16.7	13.7	7.7	6.0	13.4	7.7	5.7
1.9	1.9	14.9	10.4	39.9	33.7	1.1	10.5	7.3	20.2	20.2	13.9	7.0	6.9	12.9	6.5	6.3
2.5	2.1	10.2	7.0	43.0	37.9	1.6	10.9	6.9	19.7	20.3	17.6	8.5	9.1	15.4	8.0	7.4
2.3	2.8	11.4	9.4	41.3	36.0	1.8	10.0	7.3	21.9	20.8	13.2	5.8	7.4	12.4	5.9	6.4
1.7	1.6	15.2	11.8	39.4	32.6	1.0	10.9	7.5	22.4	22.4	13.4	7.5	5.8	13.4	7.0	6.4
1.2	2.1	18.0	9.4	35.1	37.2	0.3	11.1	8.0	18.4	20.8	14.4	6.4	8.1	13.2	6.2	7.0
1.6	1.4	16.5	12.4	38.8	30.9	1.4	9.2	5.3	19.6	18.6	11.7	6.1	5.5	10.3	5.0	5.3
2.0	1.6	18.3	12.8	41.6	26.8	0.4	11.0	9.1	18.9	17.8	12.9	7.4	5.5	12.4	7.0	5.4
1.6	2.0	12.8	8.6	43.2	34.1	1.2	9.4	7.4	18.8	18.9	16.9	8.8	8.1	17.4	9.8	7.5
2.2	2.1	9.7	8.3	40.9	39.0	2.0	10.2	8.1	21.5	22.9	18.4	9.6	8.8	19.3	11.0	8.3
2.0	2.3	10.0	6.3	43.5	38.5	1.6	7.6	6.3	18.8	17.7	17.7	8.0	9.6	20.2	12.2	8.0
1.5	2.2	15.5	7.5	43.7	32.4	0.9	8.5	7.0	20.5	20.4	16.7	9.9	6.8	16.9	8.5	8.3
2.2	2.2	13.8	9.4	41.2	34.0	1.5	11.3	7.7	20.0	19.9	17.1	7.9	9.2	15.9	9.5	6.4
0.9	1.9	14.0	10.0	44.7	30.8	0.5	9.6	7.5	16.1	16.7	16.6	9.4	7.2	17.2	9.0	8.1
1.2	1.5	14.1	10.5	45.4	29.3	0.6	9.2	8.0	15.7	15.6	14.5	8.0	6.5	14.4	8.4	6.0
0.36	0.37	1.08	1.62	1.96	2.02	0.22	1.64	1.60	2.65	2.70	0.86	1.12	1.10	0.85	1.14	1.05

Table 3. Prevalence rates of findings from the ear, nose and throat examination among children 6-11 years of age with some history of an ear or hearing problem, with standard errors for total rates: United States, 1963-65

Condition on examination	Total prevalence rate	History of abnormality							Standard error for abnormal findings
		Hearing trouble	Ear-aches	Injury to ear	Drum opened	Other ear operation	Running ears	Other ear trouble	
	Rate per 100 children								
Total prevalence rate		4.2	26.6	2.4	3.0	0.7	11.8	4.8	
Auditory canal, right									
Normal	84.3	4.0	26.2	2.3	3.2	0.7	11.6	4.7	
Abnormal	15.7	5.4	29.0	2.8	1.9	0.6	12.9	5.4	0.86
Auditory canal, left									
Normal	84.6	3.7	25.7	2.4	3.1	0.7	11.5	4.8	
Abnormal	15.4	6.8	31.5	2.5	2.2	1.1	13.9	5.1	0.85
Drum, right									
Normal	76.5	2.8	24.4	1.9	2.5	0.5	10.6	4.5	
Abnormal	13.5	10.6	37.4	4.7	5.9	2.4	18.0	6.6	1.35
Not visible	10.0	5.9	29.5	3.0	1.8	0.2	12.9	5.3	
Drum, left									
Normal	76.5	3.0	24.2	1.9	2.6	0.6	10.3	4.5	
Abnormal	13.7	10.0	36.2	5.0	5.5	1.8	18.5	6.5	1.36
Not visible	9.8	6.2	32.0	2.4	1.9	0.5	14.7	5.3	
Tonsils									
Removed	13.9	8.6	29.9	5.0	8.2	2.9	16.8	8.6	
Tags present	9.6	2.9	25.0	2.1	5.0	1.0	13.4	6.5	
Grade I	41.5	3.1	25.8	1.9	1.8	0.4	10.2	3.6	
Grade II	33.9	4.0	26.8	2.1	1.7	0.3	11.2	4.1	
Grade III	1.2	5.7	29.6	0.0	0.8	0.0	18.1	10.4	
Oral pharynx									
Normal	90.0	4.1	26.4	2.4	2.9	0.7	11.7	4.8	
Abnormal	10.0	5.5	28.5	2.8	4.0	0.9	13.8	4.7	
Nose, right									
Normal	80.5	3.8	26.3	2.3	2.9	0.7	11.4	4.7	
Abnormal	19.5	5.9	28.0	2.8	3.2	0.8	13.6	5.2	
Nose, left									
Normal	80.5	3.7	26.5	2.4	2.8	0.7	11.5	4.7	
Abnormal	19.5	6.1	27.4	2.4	3.2	0.8	12.8	5.3	
Standard error, total	-	0.37	0.82	0.16	0.34	*	0.50	0.30	

Table 4. Average hearing levels in better ear at each test frequency of children 6-11 years with and without hearing trouble by age and sex, with standard errors for total averages: United States, 1963-65

Age and sex	250 cps		500 cps		1000 cps		2000 cps		3000 cps		4000 cps		6000 cps		8000 cps	
	Hearing trouble	None	Hearing trouble	None	Hearing trouble	None	Hearing trouble	None	Hearing trouble	None	Hearing trouble	None	Hearing trouble	None	Hearing trouble	None
Both sexes	Averages in decibels re audiometric zero (ASA, 1951)															
Total, 6-11 years	-6.1	-9.6	-5.0	-9.1	-2.8	-8.0	-5.3	-9.3	-0.6	-5.3	3.1	-2.3	3.9	-2.9	0.6	-6.4
6 years	-5.4	-7.4	-4.3	-7.3	-3.8	-6.7	-6.4	-8.3	-1.5	-4.7	1.3	-1.3	3.3	-2.2	0.4	-4.6
7 years	-3.7	-8.4	-2.7	-7.8	0.5	-7.2	-5.7	-8.8	-1.1	-4.6	3.8	-1.6	3.9	-2.4	1.4	-5.9
8 years	-5.6	-9.9	-3.3	-9.2	-2.4	-7.6	-5.7	-9.4	-1.5	-5.4	2.4	-2.1	2.3	-3.5	-1.7	-6.8
9 years	-6.0	-9.9	-5.1	-9.4	-1.8	-8.3	-3.9	-9.6	1.1	-5.3	5.0	-2.4	5.9	-3.0	2.2	-7.0
10 years	-6.9	-11.0	-6.2	-10.6	-4.2	-9.1	-5.9	-9.9	-1.5	-6.0	1.2	-3.1	3.9	-3.2	1.7	-7.0
11 years	-7.5	-11.1	-6.4	-10.6	-3.7	-9.3	-3.2	-9.8	1.8	-5.8	5.9	-3.0	4.9	-2.7	0.1	-6.9
Boys																
Total, 6-11 years	-6.9	-9.9	-5.1	-9.0	-2.6	-7.8	-4.3	-9.1	0.3	-5.0	4.2	-2.1	4.2	-2.6	0.7	-6.0
6 years	-6.0	-7.7	-4.8	-7.2	-4.1	-6.4	-6.1	-8.0	-0.4	-4.2	1.3	-1.2	3.6	-2.1	-2.1	-3.8
7 years	-6.3	-8.7	-4.3	-7.6	-1.5	-6.8	-6.4	-8.6	-1.2	-4.2	2.1	-1.3	1.7	-2.2	-1.7	-5.8
8 years	-7.0	-9.9	-2.7	-8.7	-1.7	-7.3	-4.1	-9.2	-1.2	-5.0	3.7	-2.2	2.3	-3.0	-1.7	-6.1
9 years	-7.6	-10.6	-6.4	-9.7	-2.8	-8.6	-2.5	-9.6	0.2	-5.5	5.7	-2.6	6.9	-3.1	2.6	-7.2
10 years	-6.4	-11.4	-5.3	-10.4	-1.0	-8.9	-4.0	-9.8	1.8	-5.8	5.8	-2.8	6.3	-2.9	6.0	-7.0
11 years	-7.5	-11.6	-7.6	-10.7	-4.1	-9.1	-1.7	-9.8	3.4	-5.5	7.4	-2.9	5.2	-2.4	0.8	-6.5
Girls																
Total, 6-11 years	-5.1	-9.3	-4.8	-9.3	-3.0	-8.2	-6.7	-9.5	-1.8	-5.6	1.7	-2.4	3.4	-3.1	0.3	-6.7
6 years	-4.7	-7.3	-3.8	-7.5	-3.9	-7.0	-7.6	-8.6	-5.0	-5.4	0.7	-1.5	1.9	-2.4	2.0	-5.5
7 years	-0.2	-8.2	-1.4	-8.1	3.2	-7.6	-5.6	-9.0	-2.1	-5.0	5.0	-2.0	5.8	-2.7	4.8	-6.0
8 years	-3.5	-10.0	-5.5	-9.9	-4.9	-8.1	-10.2	-9.6	-2.9	-5.8	-1.7	-2.0	1.3	-4.1	-2.6	-7.6
9 years	-4.6	-9.3	-4.1	-9.2	-1.1	-8.0	-6.0	-9.7	1.7	-5.2	3.6	-2.2	4.2	-2.9	1.1	-6.8
10 years	-7.7	-10.6	-7.2	-10.9	-7.3	-9.4	-8.0	-10.2	-4.7	-6.2	-3.3	-3.5	1.6	-3.6	-2.5	-7.1
11 years	-7.8	-10.8	-5.8	-10.4	-3.3	-9.6	-4.9	-10.2	-0.1	-6.2	4.0	-3.2	4.1	-3.1	-0.9	-7.5
Standard error of average, total	0.50	0.15	0.65	0.30	0.75	0.25	0.70	0.20	0.65	0.40	0.70	0.35	0.85	0.40	0.95	0.30

Table 5. Average hearing levels in better ear at each test frequency of children 6-11 years with and without earaches, by age and sex, with standard errors for total averages. United States, 1963-65.

Age and sex	250 cps		500 cps		1000 cps		2000 cps		3000 cps		4000 cps		6000 cps		8000 cps	
	Ear-aches	None	Ear-aches	None	Ear-aches	None	Ear-aches	None	Ear-aches	None	Ear-aches	None	Ear-aches	None	Ear-aches	None
Both sexes	Averages in decibels re audiometric zero (ASA, 1951)															
Total, 6-11 years	-8.5	-9.8	-8.0	-9.3	-6.8	-8.2	-8.8	-9.3	-4.5	-5.3	-1.2	-2.4	-1.5	-3.0	-5.0	-6.5
6 years	-6.5	-7.7	-6.1	-7.6	-5.5	-7.0	-7.8	-8.3	-4.4	-4.7	-5.4	-1.5	-0.8	-2.5	-3.3	-4.9
7 years	-8.0	-8.3	-7.4	-7.7	-6.7	-6.9	-9.0	-8.5	-4.1	-4.5	-0.4	-1.5	-1.9	-2.3	-4.8	-6.0
8 years	-8.1	-10.4	-7.6	-9.6	-5.6	-8.1	-8.3	-9.6	-3.9	-5.7	-0.3	-2.4	-1.5	-4.0	-5.3	-7.1
9 years	-8.5	-10.2	-8.3	-9.5	-7.0	-8.3	-8.7	-9.5	-4.0	-5.4	-1.3	-2.3	-0.8	-3.2	-4.7	-7.2
10 years	-10.0	-11.1	-9.7	-10.6	-8.2	-9.2	-9.6	-9.8	-5.3	-5.9	-2.4	-3.1	-2.6	-3.0	-6.2	-6.7
11 years	-10.2	-11.2	-9.1	-10.8	-7.8	-9.5	-8.2	-9.7	-4.8	-5.6	-1.1	-3.1	-0.7	-2.8	-5.6	-6.9
Boys																
Total, 6-11 years	-8.6	-10.2	-7.5	-9.3	-6.3	-8.0	-8.2	-9.1	-3.8	-5.1	-0.7	-2.2	-0.9	-2.7	-4.4	-6.2
6 years	-6.6	-8.0	-5.4	-7.7	-4.9	-6.8	-7.4	-8.1	-2.9	-4.4	-0.0	-1.4	-0.6	-2.3	-2.6	-4.1
7 years	-7.9	-8.8	-6.6	-7.8	-6.0	-6.8	-8.2	-8.6	-3.4	-4.3	-1.1	-1.1	-1.3	-2.3	-4.4	-6.1
8 years	-8.9	-10.1	-7.4	-8.8	-5.7	-7.5	-8.1	-9.3	-3.6	-5.3	-0.4	-2.5	-1.3	-3.3	-5.1	-6.3
9 years	-9.0	-10.9	-7.7	-10.1	-7.0	-8.7	-8.1	-9.6	-3.9	-5.6	-0.9	-2.6	-0.2	-3.4	-4.4	-7.4
10 years	-10.5	-11.4	-9.7	-10.3	-7.7	-8.8	-9.3	-9.6	-4.9	-5.6	-1.2	-2.8	-2.2	-2.6	-5.4	-6.7
11 years	-10.3	-11.6	-9.6	-10.8	-7.8	-8.3	-8.4	-9.4	-4.6	-5.2	-0.9	-2.8	0.2	-2.5	-5.0	-6.4
Girls																
Total, 6-11 years	-8.4	-9.5	-8.5	-9.4	-7.2	-8.4	-9.3	-9.5	-5.1	-5.6	-1.6	-2.5	-1.9	-3.3	-6.2	-6.9
6 years	-6.6	-7.5	-7.0	-7.5	-6.1	-7.2	-8.2	-8.7	-6.0	-5.1	-0.9	-1.7	-1.2	-2.7	-4.3	-5.8
7 years	-8.2	-7.8	-8.3	-7.6	-7.4	-7.1	-9.8	-8.5	-4.9	-4.9	-1.5	-1.9	-2.5	-2.3	-5.0	-5.9
8 years	-7.4	-10.7	-7.8	-10.4	-5.6	-8.9	-8.6	-10.0	-4.2	-6.2	-0.4	-2.5	-1.7	-4.7	-5.6	-8.1
9 years	-8.4	-9.5	-8.9	-8.9	-7.1	-8.0	-9.5	-9.6	-4.3	-5.1	-1.8	-2.0	-1.5	-3.0	-5.2	-7.0
10 years	-9.8	-10.8	-9.9	-11.1	-8.6	-9.6	-10.1	-10.1	-5.7	-6.3	-0.3	-3.5	-2.9	-3.6	-6.9	-6.9
11 years	-10.3	-10.8	-8.8	-10.8	-8.0	-9.8	-10.0	-10.0	-5.1	-6.2	-1.3	-3.4	-1.5	-3.3	-6.2	-7.5
Standard error of average, total	0.20	0.15	0.30	0.30	0.25	0.30	0.30	0.20	0.40	0.40	0.40	0.35	0.40	0.40	0.40	0.30

Table 6. Average hearing levels in better ear at each test frequency of children 6-11 years with and without ear injury, by age and sex, with standard errors for total average: United States, 1963-65

Age and sex	250 cps		500 cps		1000 cps		2000 cps		3000 cps		4000 cps		6000 cps		8000 cps	
	Ear injury	None	Ear injury	None	Ear injury	None	Ear injury	None	Ear injury	None	Ear injury	None	Ear injury	None	Ear injury	None
Both sexes	Averages in decibels re audiometric zero (ASA, 1951)															
Total, 6-11 years . . .	-9.0	-9.5	-8.1	-9.0	-6.2	-7.9	-7.3	-9.2	-3.1	-5.2	0.2	-2.1	-0.1	-2.7	-4.1	-6.1
6 years	-8.1	-7.4	-7.9	-7.2	-6.0	-6.6	-7.7	-8.2	-5.3	-4.6	0.0	-1.2	3.2	-2.1	-0.6	-4.5
7 years	-10.1	-8.2	-7.9	-7.6	-6.7	-6.8	-7.9	-8.7	-3.0	-4.4	0.0	-1.4	-2.2	-2.2	-5.4	-5.6
8 years	-8.1	-9.8	-6.5	-9.1	-4.9	-7.5	-6.3	-9.3	-2.1	-5.3	0.3	-2.0	-0.5	-3.4	-4.1	-6.7
9 years	-6.7	- 9.8	-7.9	- 9.2	-6.0	-8.0	-8.4	-9.4	-2.3	-5.1	1.3	-2.1	1.2	-2.7	-4.2	-6.6
10 years	-8.7	-10.8	-7.0	-10.5	-4.2	-9.0	-8.0	-9.8	-2.7	-5.8	-1.1	-3.0	1.0	-3.0	-2.0	-6.7
11 years	-9.8	-11.0	-9.0	-10.4	-6.6	-9.1	-6.2	-9.6	-2.3	-0.5	2.5	-2.8	0.6	-2.4	-4.0	-6.7
Boys																
Total, 6-11 years . . .	-9.3	-9.8	-7.9	-8.9	-5.6	-7.6	-6.6	-8.9	-0.9	-4.9	2.0	-1.9	0.9	-2.4	-3.2	-5.8
Girls																
Total, 6-11 years . . .	-8.7	-9.2	-8.3	-9.1	-6.7	-8.1	-8.9	-9.4	-5.4	-5.5	-1.6	-2.3	-1.2	-2.9	-5.1	-6.5
Standard error of average, total . . .	0.65	0.15	0.75	0.30	0.75	0.25	0.65	0.20	0.90	0.35	0.95	0.35	0.95	0.40	1.00	0.25

Table 7. Average hearing levels in better ear at each test frequency of children 6-11 years with and without eardrum opened, by age and sex, with standard errors for total averages: United States, 1963-65

Age and sex	250 cps		500 cps		1000 cps		2000 cps		3000 cps		4000 cps		6000 cps		8000 cps	
	Drum opened	Not opened	Drum opened	Not opened	Drum opened	Not opened	Drum opened	Not opened	Drum opened	Not opened	Drum opened	Not opened	Drum opened	Not opened	Drum opened	Not opened
Both sexes	Averages in decibels re audiometric zero (ASA, 1951)															
Total, 6-11 years . . .	-8.2	-9.5	-7.3	-9.0	-7.5	-8.1	-8.7	-9.2	-4.4	-5.1	-1.1	-2.1	-0.4	-2.7	-3.8	-6.2
6 years	-6.6	-7.4	-4.6	-7.3	-4.5	-6.6	-6.2	-8.3	-2.4	-4.7	1.3	-1.3	2.6	-2.2	-0.7	-4.7
7 years	-8.7	-8.2	-8.2	-7.6	-8.2	-6.8	-10.1	-8.6	-5.5	-4.4	-1.9	-1.4	-1.8	-2.2	-4.8	-5.6
8 years	-8.0	-9.8	-7.8	-9.1	-4.9	-7.5	-7.2	-9.3	-2.7	-5.3	-1.5	-1.4	-0.7	-3.4	-4.4	-6.7
9 years	-6.4	-9.8	-5.0	-9.3	-4.7	-8.1	-9.1	-9.3	-5.0	-5.0	-0.5	-2.1	-2.2	-2.6	-3.2	-6.6
10 years	-9.6	-10.8	-9.4	-10.4	-7.6	-8.9	-10.3	-9.7	-5.1	-5.8	-2.3	-3.0	-0.9	-3.0	-5.5	-6.6
11 years	-7.5	-11.1	-6.7	-10.4	-3.8	-9.2	-6.8	-9.6	-2.9	-5.5	1.7	-2.7	3.3	-2.5	-1.6	-6.7
Boys																
Total, 6-11 years . . .	-8.1	-9.8	-6.2	-8.9	-5.1	-7.7	-7.8	-8.9	-3.4	-4.8	0.2	-1.9	0.4	-2.4	-3.5	-5.8
Girls																
Total, 6-11 years . . .	-8.2	-9.2	-8.7	-9.1	-7.5	-8.1	-9.7	-9.4	-5.5	-5.5	-2.6	-2.2	-1.4	-2.9	-4.1	-6.5
Standard error of average, total . . .	0.80	0.15	0.65	0.30	0.70	0.25	0.65	0.20	0.80	0.35	0.60	0.35	0.75	0.40	0.95	0.25

Table 8. Average hearing levels in better ear at each test frequency of children 6-11 years with and without running ears, by age and sex, with standard errors for total averages: United States, 1963-65

Age and sex	250 cps		500 cps		1000 cps		2000 cps		3000 cps		4000 cps		6000 cps		8000 cps	
	Running ears	Not	Running ears	Not	Running ears	Not	Running ears	Not	Running ears	Not	Running ears	Not	Running ears	Not	Running ears	Not
	Averages in decibels re audiometric zero (ASA, 1951)															
Both sexes																
Total, 6-11 years . .	-8.2	-9.7	-7.9	-9.1	-6.7	-8.0	-8.7	-9.2	-4.3	-5.2	-0.6	-2.2	-0.6	-2.9	-3.9	-6.4
6 years	-6.7	-7.5	-5.8	-7.4	-4.7	-6.8	-6.6	-8.4	-3.2	-4.8	0.7	-1.5	0.6	-2.4	-1.9	-4.8
7 years	-6.3	-8.5	-6.5	-7.8	-5.5	-7.1	-8.1	-8.7	-3.8	-4.5	0.4	-1.7	-0.4	-2.5	-2.4	-6.1
8 years	-9.5	-9.8	-8.7	-9.1	-7.6	-7.5	-9.5	-9.2	-5.4	-5.2	-2.1	-1.8	-1.8	-3.5	-5.5	-6.8
9 years	-7.8	-10.0	-7.9	-9.4	-6.9	-8.1	-8.9	-9.4	-3.2	-5.2	0.3	-2.3	0.1	-2.9	-3.1	-7.0
10 years	-9.3	-11.0	-9.3	-10.5	-7.6	-9.1	-9.5	-9.8	-4.8	-5.9	-2.0	-3.1	-1.9	-3.1	-5.1	-6.8
11 years	-10.3	-11.0	-9.4	-10.4	-8.7	-9.1	-9.4	-9.5	-4.9	-5.5	-1.0	-2.7	0.9	-2.7	-5.5	-6.7
Boys																
Total, 6-11 years . .	-8.9	-9.9	-7.8	-9.0	-6.8	-7.7	-8.5	-8.9	-3.9	-4.9	-0.4	-2.1	-0.2	-2.8	-3.4	-6.0
6 years	-7.5	-7.6	-5.7	-7.2	-5.4	-6.4	-7.0	-8.0	-2.7	-4.2	0.8	-1.3	0.4	-2.2	-1.4	-4.0
7 years	-7.2	-8.8	-6.1	-7.7	-5.5	-6.8	-7.9	-8.6	-3.3	-4.2	0.6	-1.4	-0.6	-2.3	-2.6	-6.1
8 years	-10.9	-9.6	-9.0	-8.4	-7.7	-6.9	-9.7	-8.9	-5.6	-4.7	-2.6	-1.8	-2.4	-2.9	-5.9	-6.0
9 years	-8.2	-10.7	-7.9	-9.8	-6.9	-8.5	-7.5	-9.5	-2.5	-5.6	1.0	-2.6	1.8	-3.2	-2.1	-7.2
10 years	-9.1	-11.4	-8.8	-10.3	-6.7	-8.8	-9.1	-9.6	-3.8	-5.7	-0.3	-2.7	-1.0	-2.7	-3.7	-6.7
11 years	-11.4	-11.4	-11.1	-10.5	-9.5	-8.9	-10.2	-9.1	-5.9	-5.0	-2.5	-2.5	1.4	-2.4	-5.5	-6.3
Girls																
Total, 6-11 years . .	-7.5	-9.4	-7.9	-9.3	-6.7	-8.2	-8.9	-9.5	-4.7	-5.6	-0.9	-2.4	-1.0	-3.1	-4.3	-6.8
6 years	-5.9	-7.4	-6.0	-7.5	-4.2	-7.3	-6.3	-8.8	-4.1	-5.5	0.5	-1.7	0.8	-2.7	-2.7	-5.7
7 years	-5.5	-8.3	-7.0	-7.9	-5.6	-7.5	-8.5	-9.0	-4.5	-5.0	0.1	-2.1	-0.3	-2.7	-2.3	-6.2
8 years	-7.7	-10.1	-8.4	-9.9	-7.5	-8.1	-9.4	-9.7	-5.4	-5.8	-1.6	-2.0	-1.1	-4.4	-4.9	-7.7
9 years	-7.6	-9.3	-8.0	-9.1	-7.0	-7.8	-10.4	-9.4	-4.1	-5.0	-0.6	-2.1	-1.8	-2.7	-4.4	-6.8
10 years	-9.8	-10.6	-9.9	-10.8	-8.6	-9.4	-10.0	-10.1	-5.7	-6.2	-3.5	-3.5	-2.9	-3.5	-6.5	-7.0
11 years	-9.4	-10.7	-7.8	-10.4	-8.2	-9.4	-8.5	-10.0	-4.1	-6.0	0.2	-3.1	0.0	-3.0	-6.0	-7.2
Standard error of average, total . . .	0.25	0.15	0.40	0.30	0.30	0.25	0.40	0.20	0.50	0.35	0.55	0.35	0.55	0.40	0.55	0.25

Table 9. Average hearing levels in better ear at each test frequency of children 6-11 years with and without other ear operation, by age and sex, with standard errors for total averages: United States, 1963-65

Age and sex	250 cps		500 cps		1000 cps		2000 cps		3000 cps		4000 cps		6000 cps		8000 cps	
	Other ear operation	None	Other ear operation	None	Other ear operation	None	Other ear operation	None	Other ear operation	None	Other ear operation	None	Other ear operation	None	Other ear operation	None
Both sexes	Averages in decibels re audiometric zero (ASA, 1951)															
Total, 6-11 years . .	-8.3	-9.5	-7.4	-9.0	-4.6	-7.8	-8.4	-9.1	-3.2	-5.5	-0.1	-2.1	0.3	-2.6	-2.6	-6.1
6 years	-7.5	-7.4	-5.6	-7.2	-4.0	-6.6	-7.9	-8.2	-0.8	-5.4	3.0	-1.3	1.4	-2.0	3.9	-4.5
7 years	-3.1	-8.3	-2.4	-7.6	1.9	-7.4	-1.8	-8.7	2.2	-4.5	6.3	-1.5	3.8	-2.2	1.5	-5.6
8 years	-9.1	-9.8	-10.1	-9.1	-4.8	-7.5	-6.5	-9.3	0.2	-5.2	1.5	-1.9	-2.8	-3.3	-2.8	-6.7
9 years	-6.8	-9.8	-6.2	-9.2	-6.0	-8.0	-9.4	-9.3	-2.0	-5.0	-2.0	-2.0	-1.0	-2.6	-5.3	-6.5
10 years	-8.6	-10.8	-5.2	-10.4	-2.9	-8.9	-10.0	-9.7	-0.7	-5.8	-2.3	-2.9	5.4	-2.9	-3.6	-6.6
11 years	-9.5	-11.0	-10.2	-10.4	-6.4	-9.1	-9.7	-9.5	-3.3	-5.4	-0.2	-2.6	2.0	-2.4	-3.7	-6.6
Boys																
Total, 6-11 years . .	-10.7	-9.8	-8.0	-8.8	-5.8	-7.6	-7.6	-8.9	-1.1	-4.8	0.9	-1.9	0.1	-0.3	-5.3	-5.7
Girls																
Total, 6-11 years . .	-6.0	-9.2	-6.8	-9.1	-3.4	-8.1	-9.2	-9.4	-3.2	-5.5	-1.0	-2.2	0.6	-2.9	-0.1	-6.5
Standard error of average, total . . .	1.45	0.15	1.10	0.30	1.75	0.25	1.80	0.20	1.15	0.35	1.85	0.35	1.60	0.40	2.30	0.30

Table 10. Average hearing levels in better ear at each test frequency of children 6-11 years with and without other ear trouble, by age and sex, with standard errors for total averages: United States, 1963-65

Age and sex	250 cps		500 cps		1000 cps		2000 cps		3000 cps		4000 cps		6000 cps		8000 cps	
	Other ear trouble	None	Other ear trouble	None	Other ear trouble	None	Other ear trouble	None	Other ear trouble	None	Other ear trouble	None	Other ear trouble	None	Other ear trouble	None
Both sexes	Averages in decibels re audiometric zero (ASA, 1951)															
Total, 6-11 years . .	-9.0	-9.5	-8.5	-9.0	-7.1	-7.9	-8.7	-9.2	-4.6	-5.5	-1.9	-2.0	-2.2	-2.6	-5.2	-6.1
6 years	-8.4	-7.3	-7.8	-7.1	-7.1	-6.5	-8.7	-8.2	-4.8	-4.6	-2.7	-1.2	-2.6	-2.0	-3.6	-4.5
7 years	-7.1	8.3	-6.8	-7.6	-6.1	-6.9	-9.2	-8.6	-4.1	-4.4	-0.3	-1.4	-2.8	-2.2	-4.2	-5.6
8 years	-8.0	-9.9	-6.9	-9.2	-5.8	-7.6	-8.4	-9.3	-4.0	-5.3	0.0	-2.0	-1.6	-3.4	-4.6	-6.8
9 years	-9.3	-9.8	-9.3	-9.2	-7.6	-8.0	-8.0	-9.4	-3.7	-5.1	-1.9	-2.0	-1.8	-2.6	-5.6	-6.6
10 years	-9.8	-10.8	-9.5	-10.4	-7.3	-9.0	-8.6	-9.8	-5.8	-5.8	-3.3	-2.9	-3.0	-2.9	-6.4	-6.6
11 years	-10.4	-11.0	-9.9	-10.4	-7.6	-9.1	-7.6	-9.6	-3.9	-5.5	-2.0	-2.6	-0.5	-2.4	-5.7	-6.6
Boys																
Total, 6-11 years . .	-9.4	-9.8	-8.2	-8.9	-6.6	-7.6	-8.2	-8.9	-4.5	-4.8	-2.1	-1.8	-2.8	-2.3	-4.8	-5.8
Girls																
Total, 6-11 years . .	-8.5	-9.2	-8.8	-9.1	-7.6	-8.1	-9.2	-9.4	-4.8	-5.5	-1.7	-2.3	-2.3	-2.9	-5.6	-6.5
Standard error of average, total . . .	0.30	0.15	0.40	0.30	0.35	0.25	0.50	0.20	0.50	0.35	0.60	0.35	0.55	0.40	0.45	0.30

Table 11. Average hearing levels at each test frequency of children 6-11 years of age with normal and abnormal conditions of the right or left external ear, by age and sex, with standard errors for total averages: United States, 1963-65

Ear, age, and sex	250 cps		500 cps		1000 cps		2000 cps	
	Normal	Abnormal	Normal	Abnormal	Normal	Abnormal	Normal	Abnormal
	Average in decibels re audiometric zero (ASA, 1951)							
RIGHT EAR								
Both sexes								
Total, 6-11 years	-7.6	-7.7	-7.0	-7.3	-5.7	-5.3	-6.9	-6.2
6 years	-5.3	-3.0	-4.7	-5.7	-4.3	-2.4	-5.9	-4.5
7 years	-6.6	-7.2	-5.9	-5.0	-4.9	-5.0	-6.6	-7.5
8 years	-8.0	-7.9	-7.3	-7.9	-5.5	-3.4	-7.2	-5.5
9 years	-8.0	-9.4	-7.3	-8.2	-5.9	-4.8	-7.2	-7.1
10 years	-8.8	-8.3	-8.5	-8.3	-6.8	-8.9	-7.4	-6.2
11 years	-9.3	-12.0	-8.6	-10.3	-7.2	-9.1	-7.4	-6.7
Boys								
Total, 6-11 years	-8.1	-7.4	-7.0	-7.3	-5.6	-4.8	-6.8	-5.1
Girls								
Total, 6-11 years	-7.2	-7.9	-7.0	-7.2	-5.8	-5.8	-7.0	-7.2
Standard error of average, total	0.10	0.25	0.25	0.30	0.20	0.30	0.20	0.30
LEFT EAR								
Both sexes								
Total, 6-11 years	-7.2	-6.8	-6.9	-6.1	-5.7	-4.2	-6.7	-5.6
6 years	-5.0	-7.9	-5.2	-6.6	-4.3	-5.2	-5.7	-2.8
7 years	-6.0	-5.1	-5.7	-2.9	-4.8	-1.4	-6.1	-4.8
8 years	-7.6	-6.0	-6.9	-6.1	-5.6	-4.6	-6.8	-6.7
9 years	-7.4	-3.7	-7.0	-3.7	-6.0	-2.6	-7.1	-4.8
10 years	-8.4	-7.3	-8.2	-6.3	-6.8	-4.7	-7.3	-5.4
11 years	-8.6	-8.7	-8.3	-9.7	-7.0	-4.5	-7.2	-7.1
Boys								
Total, 6-11 years	-7.5	-7.6	-6.8	-5.8	-5.5	-4.0	-6.4	-5.5
Girls								
Total, 6-11 years	-6.8	-5.8	-7.0	-6.5	-6.0	-4.3	-7.1	-5.7
Standard error of average, total	0.10	0.25	0.25	0.30	0.20	0.30	0.20	0.30

Table 11. Average hearing levels at each test frequency of children 6-11 years of age with normal and abnormal conditions of the right or left external ear, by age and sex, with standard errors for total averages: United States, 1963-65—Con.

Ear, age, and sex	3000 cps		4000 cps		6000 cps		8000 cps	
	Normal	Abnormal	Normal	Abnormal	Normal	Abnormal	Normal	Abnormal
RIGHT EAR	Average in decibels re audiometric zero (ASA, 1951)							
Both sexes								
Total, 6-11 years	-3.0	-2.5	0.8	0.6	0.6	0.6	-2.6	-3.3
6 years	-2.5	-1.5	1.8	0.1	1.4	3.4	-1.2	1.6
7 years	-2.5	-3.3	1.3	0.3	0.9	1.6	-1.9	-6.2
8 years	-3.3	-1.7	0.6	3.7	-0.1	-2.8	-3.2	-4.6
9 years	-3.0	-3.0	0.7	3.0	0.5	0.9	-3.4	-1.3
10 years	-3.6	-2.2	0.1	1.1	0.2	-0.5	-3.2	-4.8
11 years	-3.4	-5.0	0.1	-1.8	-1.8	1.3	-3.1	-3.4
Boys								
Total, 6-11 years	-2.7	-2.5	0.8	1.3	0.8	0.9	-2.3	-3.3
Girls								
Total, 6-11 years	-3.3	-2.4	0.7	-0.1	0.4	0.3	-3.0	-3.3
Standard error of average, total	0.40	0.40	0.35	0.40	0.40	0.40	0.30	0.30
LEFT EAR								
Both sexes								
Total, 6-11 years	-2.7	-2.1	1.0	1.7	1.7	3.9	-2.7	-1.2
6 years	-2.0	0.6	1.9	4.1	1.7	3.9	-1.1	-0.7
7 years	-2.0	-2.3	1.8	2.8	1.9	4.0	-2.5	-2.4
8 years	-2.8	-1.0	1.3	2.0	0.8	1.9	-3.2	-4.6
9 years	-2.8	-1.4	0.8	2.1	1.8	4.7	-3.1	0.2
10 years	-3.4	-1.4	-0.3	2.2	1.4	5.3	-3.3	1.7
11 years	-3.0	-4.8	0.7	-0.4	2.6	6.9	-3.0	2.2
Boys								
Total, 6-11 years	-2.4	-2.7	1.3	1.1	2.1	3.4	-2.3	-1.4
Girls								
Total, 6-11 years	-3.1	-1.5	0.8	2.4	1.2	4.4	-3.1	-0.9
Standard error of average, total	0.40	0.40	0.35	0.40	0.40	0.40	0.30	0.30

Table 12. Prevalence rates and average hearing levels at each test frequency for children 6-11 years of age with abnormalities of the external ear, with standard errors for averages: United States, 1963-65

Measure	Abnormalities of pinna				Abnormalities of auricular region			
	Congenital		Acquired		Posterior		Anterior	
	Right	Left	Right	Left	Right	Left	Right	Left
Prevalence rate per 100 children	0.8	0.8	0.3	0.3	0.2	0.2	0.3	0.3
Average hearing levels (in ear with abnormalites) in decibels re audiometric zero (ASA, 1951) at:								
250 cycles	-7.9	-5.5	-8.9	-6.9	-4.7	-9.3	-9.0	-7.3
500 cycles	-7.5	-4.8	-8.7	-6.6	-6.8	-8.9	-6.8	-5.6
1000 cycles	-5.6	-2.9	-5.3	-3.8	-2.8	-5.0	-6.9	-5.2
2000 cycles	-6.3	-4.7	-5.7	-4.8	-4.9	-7.4	-8.1	-6.1
3000 cycles	-3.8	-1.9	-2.2	-1.7	-3.3	-2.7	-3.6	-3.0
4000 cycles	0.5	2.8	1.2	3.0	2.8	1.4	-2.4	-0.8
6000 cycles	0.3	5.9	-0.3	3.2	4.9	0.6	-0.7	2.4
8000 cycles	-4.3	0.6	-4.1	-2.7	4.1	-3.3	-4.3	-1.6
Standard errors for:								
Rates (percent)	*	*	*	*	*	*	*	*
Averages (dB)	9.0	9.0	9.0	9.0	4.0	4.0	4.0	4.0

Table 13. Average hearing levels in right ear at each test frequency of children 6-11 years of age with normal and abnormal conditions of the right auditory canal, by age and sex, with standard deviations and standard errors for total averages: United States, 1963-65

Age and sex	250 cps		500 cps		1000 cps		2000 cps	
	Normal	Abnormal	Normal	Abnormal	Normal	Abnormal	Normal	Abnormal
Both sexes	Average in decibels re audiometric zero (ASA, 1951)							
Total, 6-11 years	-7.8	-7.0	-7.1	-6.4	-5.8	-4.9	-7.2	-5.3
6 years	-5.3	-4.8	-4.9	-3.9	-4.3	-3.5	-6.2	-4.3
7 years	-6.5	-7.0	-5.6	-7.2	-4.7	-5.6	-6.7	-5.7
8 years	-8.3	-6.2	-7.5	-5.9	-5.7	-3.5	-7.5	-4.9
9 years	-8.1	-7.4	-7.4	-6.3	-5.9	-5.4	-7.3	-6.1
10 years	-8.8	-8.5	-7.1	-7.5	-7.0	-5.5	-7.7	-5.4
11 years	-9.5	-8.3	-8.7	-8.0	-7.3	-6.2	-7.7	-5.2
Boys								
Total, 6-11 years	-8.1	-7.8	-7.1	-6.5	-5.7	-5.1	-7.1	-5.4
6 years	-5.4	-5.6	-4.9	-3.9	-3.9	-3.6	-5.8	-4.4
7 years	-6.8	-7.7	-5.3	-8.1	-4.7	-5.8	-6.6	-6.5
8 years	-8.3	-6.3	-7.1	-5.1	-5.3	-3.7	-7.3	-4.6
9 years	-8.9	-8.8	-7.9	-7.0	-6.4	-6.1	-7.4	-6.2
10 years	-9.4	-9.4	-8.6	-6.5	-6.7	-5.1	-7.3	-5.4
11 years	-10.0	-10.0	-9.0	-9.7	-7.3	-6.8	-7.9	-5.4
Girls								
Total, 6-11 years	-7.4	-6.2	-7.1	-6.3	-6.0	-4.8	-7.4	-5.3
6 years	-5.2	-4.0	-5.0	-3.9	-4.7	-3.5	-6.7	-4.3
7 years	-6.3	-6.6	-5.9	-6.6	-4.9	-5.5	-6.9	-5.2
8 years	-8.3	-6.1	-8.1	-6.6	-6.2	-3.5	-7.8	-5.3
9 years	-7.4	-6.4	-6.9	-6.0	-5.3	-5.1	-7.3	-6.2
10 years	-8.3	-7.9	-8.7	-8.4	-7.4	-5.9	-8.1	-5.6
11 years	-9.1	-6.8	-8.4	-6.6	-7.4	-5.8	-7.6	-5.2
Standard deviation, total	7.27	8.48	7.55	8.50	7.85	8.82	7.64	8.92
Standard error of average, total	0.10	0.25	0.25	0.30	0.20	0.30	0.20	0.30

Table 13. Average hearing levels in right ear at each test frequency of children 6-11 years of age with normal and abnormal conditions of the right auditory canal, by age and sex, with standard deviations and standard errors for total averages: United States, 1963-65—Con.

Age and sex	3000 cps		4000 cps		6000 cps		8000 cps	
	Normal	Abnormal	Normal	Abnormal	Normal	Abnormal	Normal	Abnormal
	Average in decibels re audiometric zero (ASA, 1951)							
Both sexes								
Total, 6-11 years	−3.3	−1.3	0.5	2.4	0.5	1.3	−2.9	−1.3
6 years	−2.6	−1.9	1.5	3.1	1.4	2.0	−1.3	−0.1
7 years	−2.7	−1.6	1.1	2.4	1.0	0.7	−2.2	−0.8
8 years	−3.8	−0.1	0.2	3.1	−0.4	1.4	−3.6	−1.1
9 years	−3.2	−1.2	0.6	1.5	0.5	0.8	−3.5	−2.4
10 years	−3.9	−1.0	−0.4	3.4	0.1	1.2	−3.6	−1.1
11 years	−3.6	−1.6	−0.1	1.3	0.5	2.0	−3.2	−2.1
Boys								
Total, 6-11 years	−3.0	−1.3	0.6	2.2	0.8	1.2	−2.5	−1.3
6 years	−1.8	−1.8	1.8	2.9	1.4	1.5	−0.6	0.0
7 years	−2.1	−2.2	1.2	2.1	1.5	0.1	−2.0	−1.4
8 years	−3.5	0.5	0.1	3.4	0.0	2.2	−2.8	0.4
9 years	−3.5	−1.6	0.5	0.2	0.3	−0.9	−3.8	−3.5
10 years	−3.6	−5.7	0.0	4.0	0.7	2.5	−2.9	−1.0
11 years	−3.3	−2.0	0.2	0.5	0.8	2.1	−3.0	−2.4
Girls								
Total, 6-11 years	−3.7	−1.3	0.3	2.6	0.2	1.3	−3.3	−1.4
6 years	−3.6	−2.0	1.1	3.2	1.3	2.3	−2.0	−0.4
7 years	−3.4	−1.3	1.0	2.6	0.4	1.2	−2.4	−0.4
8 years	−4.1	−0.8	0.3	2.7	−0.8	0.6	−4.5	−2.5
9 years	−3.1	−1.1	0.6	2.4	0.7	1.9	−3.2	−1.8
10 years	−4.4	−1.3	−0.9	2.7	−0.6	0.1	−4.4	−1.3
11 years	−4.0	−1.5	−0.4	1.8	0.1	1.8	−3.4	−2.0
Standard deviation, total	8.14	9.04	8.55	9.79	10.38	10.96	10.46	11.27
Standard error of average, total	0.40	0.40	0.35	0.40	0.40	0.40	0.30	0.30

Table 14. Average hearing levels in left ear at each test frequency of children 6-11 years of age with normal and abnormal conditions of the left auditory canal, by age and sex, with standard deviations and standard errors for total averages: United States, 1963-65

Age and sex	250 cps		500 cps		1000 cps		2000 cps	
	Normal	Abnormal	Normal	Abnormal	Normal	Abnormal	Normal	Abnormal
	Average in decibels re audiometric zero (ASA, 1951)							
Both sexes								
Total, 6-11 years	-7.4	-6.0	-7.0	-6.1	-5.9	-4.6	-7.0	-5.1
6 years	-5.3	-4.0	-5.3	-4.4	-4.4	-3.6	-5.9	-4.6
7 years	-6.2	-4.8	-5.8	-4.9	-5.0	-3.7	-6.3	-4.6
8 years	-7.7	-6.5	-7.0	-6.3	-5.7	-4.6	-7.0	-5.4
9 years	-7.6	-6.1	-7.2	-5.4	-6.1	-4.6	-7.4	-5.2
10 years	-8.5	-7.7	-8.1	-8.4	-6.9	-6.0	-7.5	-5.6
11 years	-8.8	-7.2	-8.5	-7.4	-7.2	-5.2	-7.5	-5.2
Boys								
Total, 6-11 years	-7.6	-6.9	-6.9	-6.0	-5.6	-4.2	-6.6	-4.7
6 years	-5.2	-5.4	-4.8	-4.9	-3.9	-3.8	-5.4	-4.1
7 years	-6.7	-5.3	-5.8	-4.8	-4.9	-2.3	-6.0	-4.7
8 years	-7.7	-6.6	-6.4	-6.1	-4.9	-4.7	-6.4	-5.2
9 years	-8.2	-7.0	-7.8	-5.1	-6.4	-4.3	-7.3	-4.7
10 years	-8.8	-9.9	-7.9	-8.6	-6.6	-5.3	-7.3	-5.8
11 years	-9.3	-7.9	-8.8	-7.6	-7.1	-4.9	-7.2	-3.6
Girls								
Total, 6-11 years	-7.1	-5.3	-7.1	-6.1	-6.2	-5.0	-7.4	-5.5
6 years	-5.5	-2.9	-6.0	-4.2	-5.1	-3.6	-6.5	-5.1
7 years	-5.8	-4.6	-6.0	-5.1	-5.2	-4.8	-6.7	-4.6
8 years	-7.8	-6.6	-7.7	-6.7	-6.7	-4.6	-7.7	-5.6
9 years	-6.9	-5.4	-6.7	-5.9	-5.9	-5.0	-7.5	-5.8
10 years	-8.2	-6.4	-8.4	-8.5	-7.2	-6.6	-7.9	-5.6
11 years	-8.4	-6.8	-8.3	-7.3	-7.3	-5.6	-7.9	-6.7
Standard deviation, total	7.58	8.38	7.83	8.67	7.93	8.66	7.56	8.44
Standard error of average, total	0.20	0.30	0.30	0.50	0.30	0.50	0.20	0.35

Table 14. Average hearing levels in left ear at each test frequency of children 6-11 years of age with normal and abnormal conditions of the left auditory canal, by age and sex, with standard deviations and standard errors for total averages: United States, 1963-65—Con.

Age and sex	3000 cps		4000 cps		6000 cps		8000 cps	
	Normal	Abnormal	Normal	Abnormal	Normal	Abnormal	Normal	Abnormal
	Average in decibels re audiometric zero (ASA, 1951)							
Both sexes								
Total, 6-11 years	-3.0	-1.1	0.8	2.4	1.5	2.9	-3.0	-1.0
6 years	-2.1	-1.4	1.7	2.7	1.7	2.2	-1.4	0.0
7 years	-2.4	-0.1	1.5	3.8	1.5	4.0	-3.0	0.2
8 years	-3.1	-0.7	1.1	2.9	0.5	2.6	-3.5	-1.7
9 years	-3.1	-0.8	0.6	2.3	1.6	3.4	-3.3	-1.7
10 years	-3.6	-2.3	-0.4	0.6	1.3	2.1	-3.4	-1.9
11 years	-3.3	-1.1	0.5	2.4	2.4	4.1	-3.3	-0.6
Boys								
Total, 6-11 years	-2.6	-0.9	1.1	2.5	2.0	2.8	-2.5	-0.9
6 years	-1.5	-1.3	2.2	2.3	2.4	2.6	-0.9	0.8
7 years	-2.1	0.1	1.7	3.9	1.9	3.6	-2.5	0.2
8 years	-2.6	-0.4	1.3	3.7	1.3	2.5	-2.6	-1.9
9 years	-3.2	-1.3	0.5	1.5	1.8	2.5	-3.2	-1.2
10 years	-3.1	-2.7	0.1	0.4	1.5	1.7	-3.1	-4.6
11 years	-3.0	0.0	0.7	2.7	3.0	3.9	-2.9	0.8
Girls								
Total, 6-11 years	-3.4	-1.3	0.5	2.4	0.9	3.0	-3.0	-1.1
6 years	-3.0	-1.6	1.2	2.9	0.8	1.7	-2.1	-0.7
7 years	-2.8	-0.3	1.1	3.7	0.9	4.1	-3.7	0.0
8 years	-3.8	-1.0	0.7	2.2	-0.5	2.5	-4.6	-1.7
9 years	-3.0	-0.5	0.6	2.8	1.3	4.0	-3.5	-2.4
10 years	-4.1	-2.3	4.0	0.5	1.1	2.1	-3.7	-0.3
11 years	-3.7	-2.1	0.1	2.0	1.7	3.9	-3.8	-2.0
Standard deviation, total	8.02	8.62	8.99	10.06	10.93	11.76	10.36	11.54
Standard error of average, total	0.35	0.45	0.40	0.55	0.40	0.55	0.30	0.45

Table 15. Average hearing level at each test frequency of children 6-11 years of age with partial or complete occlusion of the auditory canal, by ear, age, sex, and degree of occlusion, with standard errors of total averages: United States, 1963-65

Age and sex	250 cps			500 cps			1000 cps			2000 cps		
	Total occluded	Partially	Completely	Total occluded	Partially	Completely	Total occluded	Partially	Completely	Total occluded	Partially	Completely
RIGHT EAR												
Both sexes	Average in decibels re audiometric zero (ASA, 1951)											
Total, 6-11 years . .	-7.1	-7.5	-6.5	-6.5	-6.9	-6.0	-5.1	-5.4	-4.7	-5.5	-6.5	-4.4
6 years	-5.3	-5.6	-4.2	-4.1	-4.8	-3.1	-3.6	-4.3	-2.6	-4.6	-5.9	-2.9
7 years	-7.2	-8.1	-6.0	-7.1	-7.8	-6.6	-5.8	-6.3	-4.9	-5.9	-7.0	-4.6
8 years	-6.4	-6.5	-5.8	-6.0	-5.1	-6.7	-3.8	-3.8	-3.3	-5.2	-5.3	-4.4
9 years	-7.7	-7.5	-7.3	-6.6	-6.9	-5.9	-5.8	-6.2	-5.1	-6.6	-7.6	-5.3
10 years	-8.7	-8.8	-7.9	-7.5	-7.9	-6.8	-5.6	-5.2	-5.6	-5.5	-6.1	-4.4
11 years	-8.5	-8.4	-8.1	-8.4	-8.7	-7.3	-6.4	-6.2	-6.3	-5.5	-6.8	-3.5
Boys												
Total, 6-11 years . .	-8.0	-8.1	-7.7	-6.6	-6.9	-6.3	-5.2	-5.5	-4.8	-5.6	-6.5	-4.5
Girls												
Total, 6-11 years . .	-6.3	-7.5	-5.5	-6.4	-6.9	-5.8	-5.0	-5.3	-4.6	-5.4	-6.5	-4.2
Standard error of average, total . . .	0.25	0.30	0.30	0.30	0.45	0.30	0.30	0.40	0.45	0.25	0.40	0.30
LEFT EAR												
Both sexes												
Total, 6-11 years . .	-6.0	-6.3	-5.7	-6.2	-6.4	-5.9	-4.8	-4.9	-4.5	-5.2	-6.1	-4.2
6 years	-4.3	-4.0	-4.2	-4.7	-4.3	-4.9	-3.8	-3.2	-4.3	-4.9	-5.3	-3.8
7 years	-4.8	-5.4	-3.7	-5.0	-5.9	-3.6	-3.6	-4.7	-2.5	-4.8	-6.1	-2.6
8 years	-6.7	-6.7	-6.4	-8.5	-6.4	-6.4	-4.8	-4.3	-4.9	-5.6	-5.4	-5.4
9 years	-6.3	-6.1	-6.3	-5.6	-5.9	-5.1	-5.0	-5.1	-4.6	-5.6	-6.2	-4.6
10 years	-8.2	-9.3	-5.8	-8.6	-9.2	-7.6	-6.0	-7.0	-5.1	-5.9	-7.5	-3.8
11 years	-6.5	-7.0	-7.7	-7.5	-7.2	-7.5	-5.4	-5.3	-5.1	-5.3	-5.8	-4.3
Boys												
Total, 6-11 years . .	-6.9	-6.8	-7.0	-6.2	-6.1	-6.1	-4.2	-4.2	-4.2	-4.8	-5.5	-4.0
Girls												
Total, 6-11 years . .	-5.4	-6.0	-5.7	-6.2	-6.6	-5.7	-5.2	-5.4	-4.7	-5.6	-6.1	-4.5
Standard error of average, total . . .	0.30	0.40	0.40	0.50	0.60	0.65	0.50	0.60	0.65	0.30	0.45	0.35

Table 15. Average hearing levels at each test frequency of children 6-11 years of age with partial or complete occlusion of the auditory canal, by ear, age, sex, and degree of occlusion, with standard errors of total averages: United States, 1963-65—Con.

Age and sex	3000 cps			4000 cps			6000 cps			8000 cps		
	Total occluded	Partially	Completely	Total occluded	Partially	Completely	Total occluded	Partially	Completely	Total occluded	Partially	Completely
RIGHT EAR	Average in decibels re audiometric zero (ASA, 1951)											
Both sexes												
Total, 6-11 years . .	-1.4	-2.2	-0.6	2.3	2.2	2.5	1.1	0.8	1.5	-1.4	-2.0	-0.8
6 years	-2.1	-3.1	-0.8	2.8	2.0	4.0	1.5	0.6	2.7	-0.6	-2.1	1.2
7 years	-2.0	-2.8	-0.7	2.3	2.0	3.0	0.6	-0.5	1.9	-0.9	-1.2	-0.2
8 years	-0.2	-0.6	0.6	3.0	3.4	2.9	1.2	2.9	-0.7	-1.2	-0.4	-2.1
9 years	-1.6	-2.4	-0.6	1.1	0.9	1.9	0.4	1.2	0.4	-2.6	-2.8	-2.1
10 years	-0.9	-1.0	-0.4	3.4	4.4	2.5	1.4	0.5	2.6	-1.0	-2.1	-0.6
11 years	-1.9	-2.6	-0.6	1.0	1.5	0.8	1.6	1.1	2.8	-2.4	-2.8	-1.6
Boys												
Total, 6-11 years . .	-1.5	-2.1	-0.8	2.0	2.1	2.0	1.0	0.7	1.4	-1.4	-1.9	-0.8
Girls												
Total, 6-11 years . .	-1.4	-2.3	-0.4	2.5	2.3	2.8	1.2	0.9	1.5	-1.5	-2.1	-0.8
Standard error of average, total . . .	0.35	0.50	0.40	0.40	0.60	0.40	0.40	0.45	0.60	0.30	0.45	0.45
LEFT EAR												
Both sexes												
Total, 6-11 years . .	-1.2	-1.6	-0.7	2.2	2.5	2.0	2.7	2.6	2.9	-1.1	-1.3	-0.8
6 years	-1.7	-2.3	-0.7	2.4	2.0	3.1	1.8	2.1	1.5	-0.4	-0.4	-0.3
7 years	-0.2	-1.3	1.4	3.6	3.3	4.3	3.8	2.3	6.1	0.0	-0.9	1.3
8 years	-0.9	-0.6	-1.0	2.6	3.7	1.6	2.2	2.8	2.1	-2.0	-2.1	-1.4
9 years	-1.1	-1.0	-0.8	1.9	2.0	2.3	3.0	3.7	2.6	-1.9	-1.5	-2.2
10 years	-2.4	-2.4	-2.0	0.6	1.7	-0.3	2.0	1.9	2.5	-2.3	-1.8	-1.6
11 years	-1.2	-1.4	-0.6	2.2	3.1	1.7	3.6	3.5	4.2	-0.6	-1.0	0.0
Boys												
Total, 6-11 years . .	-1.0	-1.0	-0.9	2.4	2.8	1.9	2.8	3.2	2.4	-0.8	-0.9	-0.7
Girls												
Total, 6-11 years . .	-1.4	-2.1	-0.6	2.2	2.5	2.0	2.6	2.6	3.4	-1.4	-1.6	-0.9
Standard error of average, total . . .	0.40	0.50	0.50	0.55	0.70	0.55	0.50	0.70	0.65	0.40	0.45	0.65

Table 16. Average hearing levels at each test frequency of children 6-11 years of age by condition of the drum in ear under test, age and sex, with standard errors of total averages: United States, 1963-65

Ear, age, and sex	250 cps			500 cps			1000 cps			2000 cps		
	Normal	Abnormal	Not visible	Normal	Abnormal	Not visible	Normal	Abnormal	Not visible	Normal	Abnormal	Not visible
RIGHT EAR												
Both sexes	Average in decibels re audiometric zero (ASA, 1951)											
Total, 6-11 years . .	-8.1	-5.5	-7.0	-7.5	-4.5	-6.4	-6.3	-2.8	-5.0	-7.5	-5.4	-4.8
6 years	-5.6	-3.5	-4.4	-5.2	-2.5	-3.8	-4.8	-1.7	-2.7	-6.5	-4.4	-3.2
7 years	-7.0	-4.7	-6.3	-6.1	-3.8	-6.9	-5.3	-2.2	-5.6	-7.0	-5.3	-5.2
8 years	-8.5	-4.9	-7.2	-8.0	-3.2	-6.9	-6.2	-1.4	-3.9	-7.8	-4.6	-4.7
9 years	-8.5	-4.8	-7.8	-7.8	-4.4	-6.2	-6.3	-2.5	-5.6	-7.7	-4.8	-5.8
10 years	-9.1	-7.2	-8.1	-8.9	-6.2	-7.3	-7.4	-3.8	-5.7	-7.8	-6.1	-4.7
11 years	-9.7	-7.6	-8.5	-9.1	-6.4	-7.6	-7.5	-5.0	-7.0	-7.8	-6.6	-4.9
Boys												
Total, 6-11 years . .	-8.4	-6.0	-8.5	-7.5	-4.4	-7.0	-6.2	-2.8	-5.4	-7.3	-5.3	-5.4
Girls												
Total, 6-11 years . .	-7.8	-4.8	-5.8	-7.5	-4.6	-5.9	-6.4	-2.8	-4.7	-7.7	-5.5	-4.4
Standard error of average, total . . .	0.15	0.40	0.25	0.25	0.55	0.30	0.20	0.55	0.30	0.25	0.45	0.30
LEFT EAR												
Both sexes												
Total, 6-11 years . .	-7.7	-5.1	-6.0	-7.3	-4.8	-6.1	-6.3	-3.3	-4.8	-7.1	-5.6	-4.7
6 years	-5.4	-3.5	-4.6	-5.5	-3.6	-4.9	-4.8	-1.8	-4.1	-6.2	-4.0	-4.1
7 years	-6.6	-4.1	-4.6	-6.2	-3.7	-4.5	-5.3	-2.9	-3.3	-6.4	-5.8	-3.8
8 years	-8.0	-4.7	-7.0	-7.4	-3.7	-7.1	-6.1	-2.4	-5.4	-7.2	-4.4	-5.8
9 years	-8.0	-5.4	-5.2	-7.7	-4.9	-4.1	-6.5	-3.9	-4.1	-7.6	-6.6	-3.5
10 years	-8.7	-7.0	-7.7	-8.4	-6.2	-8.8	-7.2	-4.1	-6.2	-7.6	-5.9	-5.8
11 years	-9.1	-6.0	-7.3	-8.8	-6.3	-7.5	-7.4	-4.5	-5.6	-7.6	-6.3	-4.4
Boys												
Total, 6-11 years . .	-7.9	-5.8	-7.2	-7.2	-5.2	-6.1	-6.0	-3.2	-4.4	-6.7	-5.5	-4.4
Girls												
Total, 6-11 years . .	-7.4	-4.3	-5.1	-7.5	-4.3	-6.1	-6.6	-3.5	-5.1	-7.6	-5.6	-4.9
Standard error of average, total . . .	0.15	0.40	0.25	0.25	0.55	0.30	0.20	0.55	0.30	0.25	0.45	0.30

Table 16. Average hearing levels at each test frequency of children 6-11 years of age by condition of the drum in, ear under test, age and sex, with standard errors of total averages: United States, 1963-65—Con.

Ear, age, and sex	3000 cps			4000 cps			6000 cps			8000 cps		
	Normal	Abnormal	Not visible	Normal	Abnormal	Not visible	Normal	Abnormal	Not visible	Normal	Abnormal	Not visible
RIGHT EAR	Average in decibels re audiometric zero (ASA, 1951)											
Both sexes												
Total, 6-11 years . .	-3.6	-1.4	-1.1	0.2	3.1	2.3	0.1	3.3	1.1	-3.3	-0.3	-1.0
6 years	-3.0	-0.8	-1.2	1.3	3.1	3.3	0.8	4.4	2.4	-1.8	0.9	1.0
7 years	-3.0	-0.6	-1.3	0.5	4.9	2.4	0.6	3.1	0.7	-2.6	0.6	-0.7
8 years	-3.9	-1.1	0.0	0.0	3.3	3.1	-0.9	4.7	0.2	-3.9	-0.5	-0.9
9 years	-3.3	-1.9	-1.2	0.3	2.5	1.4	0.3	2.6	-0.1	-3.8	-0.7	-2.8
10 years	-4.2	-1.5	-0.3	-0.7	2.9	3.4	-0.6	3.5	2.8	-3.9	-0.8	-0.1
11 years	-3.7	-2.0	-1.6	-0.3	2.4	0.4	0.4	2.1	1.9	-3.4	-1.1	-2.1
Boys												
Total, 6-11 years . .	-3.3	-0.7	-1.4	0.3	3.2	1.7	0.4	3.3	0.7	-2.9	-0.1	-1.3
Girls												
Total, 6-11 years . .	-3.9	-2.1	-0.8	0.0	3.0	2.7	-0.3	3.3	1.5	-3.7	-0.6	-0.7
Standard error of average, total . . .	0.40	0.55	0.45	0.35	0.60	0.40	0.35	0.75	0.50	0.30	0.65	0.45
LEFT EAR												
Both sexes												
Total, 6-11 years . .	-3.2	-0.9	-1.0	0.5	3.2	2.2	1.0	4.6	3.1	-3.3	-0.5	-0.9
6 years	-2.5	0.2	-1.2	1.4	4.0	3.1	1.1	5.1	2.0	-1.8	1.8	-0.5
7 years	-2.7	-0.5	0.8	1.3	2.9	4.2	1.3	2.6	5.1	-3.3	-0.8	-0.9
8 years	-3.2	-0.9	-1.5	0.7	5.0	2.0	0.0	5.0	2.0	-4.0	-0.2	-1.4
9 years	-3.2	-1.9	0.2	0.4	2.3	2.5	1.1	4.4	4.8	-3.7	-0.9	-0.8
10 years	-3.8	-1.0	-3.1	-0.7	2.7	-0.7	0.6	6.4	1.7	-3.6	-0.9	-2.3
11 years	-3.5	-1.0	-0.9	0.3	2.8	1.9	2.0	5.2	4.6	-3.4	-1.4	-0.6
Boys												
Total, 6-11 years . .	-2.8	-0.8	-0.9	0.8	3.1	2.2	1.5	4.7	2.9	-2.9	-0.3	-0.7
Girls												
Total, 6-11 years . .	-3.6	-1.2	-1.1	0.2	3.2	2.1	0.4	4.5	3.4	-3.8	-0.7	-1.0
Standard error of average, total . . .	0.40	0.55	0.45	0.35	0.60	0.40	0.35	0.75	0.50	0.30	0.65	0.45

Table 17. Average hearing levels at each test frequency of children 6-11 years of age by mobility of the drum of the ear, under test, age, and sex, with standard deviations and standard errors of total averages: United States, 1963-65

Ear, age, and sex	250 cps			500 cps			1000 cps			2000 cps		
	Yes	No	Pneumatic otoscopy unsatis-factory	Yes	No	Pneumatic otoscopy unsatis-factory	Yes	No	Pneumatic otoscopy unsatis-factory	Yes	No	Pneumatic otoscopy unsatis-factory
	Average in decibels re audiometric zero (ASA, 1951)											
RIGHT EAR												
Both sexes												
Total, 6-11 years . .	-8.0	-4.0	-7.1	-7.4	-2.2	-6.5	-6.1	-0.3	-5.1	-7.4	-4.3	-5.2
6 years	-5.4	-3.3	-4.4	-5.1	-1.3	-3.7	-4.7	0.9	-2.9	-6.4	-4.4	-3.8
7 years	-7.0	-1.7	-6.2	-6.1	0.0	-6.9	-5.2	2.1	-5.6	-7.0	-2.4	-5.5
8 years	-8.3	-3.1	-7.3	-7.8	0.8	-6.9	-6.0	2.4	-3.8	-7.6	-3.4	-4.9
9 years	-8.4	-2.2	-7.7	-7.8	-1.1	-6.2	-6.2	0.6	-5.8	-7.6	-2.1	-6.0
10 years	-9.1	-4.1	-8.3	-8.8	-3.3	-7.3	-7.2	-1.3	-5.6	-7.7	-4.7	-5.2
11 years	-9.5	-9.0	-8.8	-8.8	-7.6	-7.9	-7.3	-5.7	-6.7	-7.7	-8.0	-5.2
Boys												
Total, 6-11 years . .	-8.2	-4.8	-8.5	-7.3	-2.8	-7 1	-6.0	-0.7	-5.6	-7.2	-4.3	-5.6
Girls												
Total, 6-11 years . .	-7.7	-2.8	-5.9	-7.5	-1.4	-5.9	-6.3	0.3	-4.7	-7.6	-4.2	-4.9
Standard deviation, total	---	11.00	---	---	10.31	---	---	10.88	---	---	9.78	---
Standard error of average, total . . .	0.10	0.85	0.25	0.25	1.05	0.25	0.20	1.20	0.30	0.20	0.80	0.25
LEFT EAR												
Both sexes												
Total, 6-11 years . .	-7.5	-4.5	-6.1	-7.2	-3.5	-6.1	-6.1	-1.7	-4.8	-7.0	-4.4	-5.0
6 years	-5.3	-3.0	-4.5	-5.5	-2.1	-4.5	-4.7	0.8	-3.8	-6.0	-3.6	-3.9
7 years	-6.3	-4.1	-4.5	-5.9	-3.6	-4.4	-5.1	-2.2	-3.5	-6.3	-5.4	-4.3
8 years	-7.9	-2.9	-6.7	-7.3	-1.2	-6.4	-6.0	0.8	-4.8	-7.2	-1.9	-5.5
9 years	-7.7	-5.0	-5.2	-7.4	-4.6	-4.2	-6.3	-2.7	-4.2	-7.5	-5.0	-4.1
10 years	-8.5	-5.5	-8.2	-8.1	-4.2	-9.4	-7.0	-2.8	-6.5	-7.5	-5.1	-6.3
11 years	-8.9	-5.1	-7.5	-8.6	-4.1	-8.0	-7.3	-2.6	-5.6	-7.6	-4.5	-5.4
Boys												
Total, 6-11 years . .	-7.7	-5.3	-7.2	-7.0	-4.0	-6.2	-5.8	-1.5	-4.6	-6.6	-4.8	-4.8
Girls												
Total, 6-11 years . .	-7.2	-3.3	-5.2	-7.3	-2.8	-6.0	-6.4	-1.9	-4.9	-7.5	-4.0	-5.1
Standard deviation, total	---	10.18	---	---	10.99	---	---	11.90	---	---	10.04	---
Standard error of average, total . . .	0.35	1.30	0.45	0.40	1.15	0.60	0.40	1.25	0.55	0.30	1.05	0.45

Table 17. Average hearing levels at each test frequency of children 6-11 years of age by mobility of the drum of the ear, under test, age, and sex, with standard deviations and standard errors of total averages: United States, 1963-65—Con.

Ear, age, and sex	3000 cps			4000 cps			6000 cps			8000 cps		
	Yes	No	Pneumatic otoscopy unsatisfactory	Yes	No	Pneumatic otoscopy unsatisfactory	Yes	No	Pneumatic otoscopy unsatisfactory	Yes	No	Pneumatic otoscopy unsatisfactory
	Average in decibels re audiometric zero (ASA, 1951)											
RIGHT EAR												
Both sexes												
Total, 6-11 years . .	-3.4	0.0	-1.4	0.3	4.4	2.3	0.3	5.0	1.0	-3.1	0.6	-0.9
6 years	-2.8	0.5	-1.4	1.3	4.8	3.1	1.1	5.6	2.2	-1.5	-0.2	0.9
7 years	-2.8	1.0	-1.7	0.8	6.9	2.7	0.6	6.3	0.6	-2.5	3.7	-0.9
8 years	-3.8	0.5	-0.5	0.1	5.3	3.2	-0.5	7.4	0.0	-3.7	1.1	-1.3
9 years	-3.5	2.0	-1.2	0.3	5.2	1.5	-0.3	6.1	0.5	-3.9	2.1	-1.9
10 years	-4.0	0.3	-0.7	-0.4	4.2	3.1	-0.2	4.1	2.0	-3.7	0.2	-0.6
11 years	-3.5	-3.4	-2.2	-0.1	1.3	0.8	0.5	1.2	1.7	-3.3	-2.6	-1.4
Boys												
Total, 6-11 years . .	-3.1	0.4	-1.7	0.5	3.8	2.0	0.6	5.0	0.6	-2.7	0.7	-1.2
Girls												
Total, 6-11 years . .	-3.8	-0.6	-1.2	0.1	5.3	2.6	-0.1	4.9	1.4	-3.6	0.5	-0.7
Standard deviation, total	---	10.29	---	---	15.50	---	---	10.38	---	---	10.46	---
Standard error of average, total . . .	0.40	0.90	0.30	0.35	1.00	0.35	0.40	1.25	0.40	0.30	1.05	0.40
LEFT EAR												
Both sexes												
Total, 6-11 years . .	-3.0	-0.1	-1.1	0.7	4.7	2.2	1.3	5.2	3.0	-3.2	1.3	-0.9
6 years	-2.2	0.4	-1.2	1.5	6.4	3.1	1.5	5.1	2.4	-1.4	3.6	-0.6
7 years	-2.4	-1.2	0.4	1.5	2.4	4.1	1.6	1.9	4.4	-3.1	-1.0	0.8
8 years	-3.2	1.2	-1.2	0.8	8.4	2.3	0.3	6.2	2.0	-3.8	2.9	-1.7
9 years	-3.1	-2.0	0.3	0.5	3.5	2.6	1.5	4.2	4.5	-3.5	0.1	-0.6
10 years	-3.6	1.2	-3.4	-0.4	4.5	-0.6	1.1	8.4	1.5	-3.5	1.6	-2.6
11 years	-3.5	1.5	-1.1	0.3	4.6	2.1	2.3	7.0	4.0	-3.5	2.1	-0.3
Boys												
Total, 6-11 years . .	-2.6	-0.2	-0.9	1.0	4.3	2.3	1.9	5.1	2.7	-2.7	1.0	-0.8
Girls												
Total, 6-11 years . .	-3.5	0.1	-1.3	0.4	5.3	2.1	0.8	5.2	3.2	-3.7	1.6	-1.0
Standard deviation, total	---	11.60	---	---	12.90	---	---	14.20	---	---	13.66	---
Standard error of average, total . . .	0.20	0.95	0.35	0.30	1.25	0.50	0.30	1.50	0.50	0.20	0.75	0.35

Table 18. Average hearing levels in right and left ear at each test frequency for children 6-11 years of age with a dull tympanic membrane in the test ear, by age and sex, with standard errors of total averages: United States, 1963-65

Ear, age, and sex	250 cps	500 cps	1000 cps	2000 cps	3000 cps	4000 cps	6000 cps	8000 cps
RIGHT EAR								
Both sexes	Average in decibels re audiometric zero (ASA, 1951)							
Total, 6-11 years	-4.9	-4.4	-3.1	-5.0	-1.3	3.1	3.6	0.4
6 years	-0.6	-0.5	0.2	-3.8	0.2	5.4	6.8	4.9
7 years	-6.9	-5.8	-5.4	-6.8	-2.2	2.7	0.9	-1.7
8 years	-6.0	-5.1	-3.0	-5.0	-2.9	1.8	4.6	-1.0
9 years	-3.3	-3.3	-2.0	-4.1	-1.4	3.0	2.4	-0.5
10 years	-6.4	-5.6	-2.5	-4.6	0.2	4.7	4.9	0.7
11 years	-7.6	-6.9	-5.7	-6.1	-2.3	0.6	2.1	0.0
Boys								
Total, 6-11 years	-5.0	-4.0	-2.6	-4.6	0.0	3.6	3.4	0.5
Girls								
Total, 6-11 years	-4.8	-4.8	-3.6	-5.5	-2.9	2.5	3.9	0.2
LEFT EAR								
Both sexes								
Total, 6-11 years	-5.3	-5.2	-3.1	-4.6	-0.8	3.8	5.0	-0.1
6 years	-3.1	-2.5	-0.4	-3.4	-0.2	4.0	6.5	3.2
7 years	-5.6	-6.3	-4.8	-5.8	-1.4	1.4	1.1	-2.3
8 years	-4.2	-3.9	-1.1	-2.8	-0.2	6.0	6.9	0.5
9 years	-7.0	-6.2	-4.8	-6.6	-2.2	3.2	5.0	0.0
10 years	-6.3	-6.8	-3.5	-3.9	0.4	4.8	7.0	-1.0
11 years	-4.7	-5.1	-3.2	-3.8	0.2	5.2	6.3	-0.3
Boys								
Total, 6-11 years	-5.5	-5.0	-2.1	-4.1	0.1	3.9	5.0	0.5
Girls								
Total, 6-11 years	-5.1	-5.5	-4.2	-5.1	-1.7	3.7	5.1	-0.9
Standard deviation, total								
Right	9.88	9.76	10.19	9.71	10.56	10.74	13.35	12.51
Left	8.95	9.74	11.06	9.46	10.68	11.68	12.08	12.01
Standard error of average, total								
Right	0.65	0.90	1.00	0.65	0.80	0.80	1.00	1.05
Left	0.75	0.90	1.05	0.70	0.85	0.80	0.85	0.80

Table 19. Average hearing levels in right and left ear at each test frequency for children 6-11 years of age with a transparent or opaque tympanic membrane in the test ear by age and sex, with standard errors of total averages: United States, 1963-65

Ear, age, and sex	250 cps		500 cps		1000 cps		2000 cps		3000 cps		4000 cps		6000 cps		8000 cps	
	Trans-parent	Opaque	Trans-parent	Opaque	Trans-parent	Opaque	Trans-parent	Opaque	Trans-parent	Opaque	Trans-parent	Opaque	Trans-parent	Opaque	Trans-parent	Opaque
RIGHT EAR	Average in decibels re audiometric zero (ASA, 1951)															
Both sexes																
Total, 6-11 years . .	-6.9	-4.7	-5.8	-3.2	-4.1	-1.7	-6.4	-3.8	-3.9	0.1	1.5	4.0	2.2	5.3	-0.9	0.5
6 years	-5.0	-0.4	-3.5	0.1	-2.4	2.0	-5.5	-1.7	-2.9	-0.1	1.3	3.7	2.6	8.5	-0.3	2.1
7 years	-5.2	-4.8	-4.0	-3.6	-3.1	-2.1	-6.7	-3.7	-2.5	0.4	4.9	4.4	2.9	5.6	0.9	0.7
8 years	-7.5	-4.7	-6.4	-2.5	-3.4	-0.8	-6.6	-3.7	-4.6	0.8	1.1	4.1	1.9	6.3	-1.6	0.4
9 years	-7.5	-2.0	-6.8	-1.2	-3.9	-0.7	-5.2	-1.3	-4.9	1.2	0.7	4.1	2.7	3.9	-1.4	2.1
10 years	-8.8	-5.8	-7.4	-3.9	-5.4	-1.2	-7.5	-6.5	-5.1	-0.1	-0.3	3.0	2.7	4.8	-1.1	-3.0
11 years	-7.5	-8.6	-7.5	-7.1	-5.8	-6.0	-7.4	-6.5	-3.9	-1.2	0.9	2.5	1.0	4.0	-3.5	0.5
Boys																
Total, 6-11 years . .	-8.1	-5.8	-6.1	-3.1	-4.8	-1.6	-6.6	-4.0	-3.9	0.6	0.5	3.2	1.9	4.4	-0.8	0.7
Girls																
Total, 6-11 years . .	-5.6	-3.5	-5.6	-3.3	-3.3	-1.8	-6.3	-3.6	-3.9	-0.5	2.5	4.8	2.5	6.2	-1.0	0.2
LEFT EAR																
Both sexes																
Total, 6-11 years . .	-6.1	-4.9	-6.4	-4.0	-5.7	-2.4	-7.3	-4.0	-3.1	0.5	0.4	4.9	4.1	5.7	-2.0	0.8
6 years	-5.1	-1.6	-6.3	-1.6	-4.9	0.7	-6.7	-1.1	-3.2	3.7	1.0	5.5	1.2	8.7	-2.2	5.5
7 years	-3.9	-5.5	-3.5	-5.5	-3.8	-4.8	-6.8	-4.1	-1.2	-1.9	1.9	2.4	4.5	1.4	-2.1	-0.9
8 years	-7.6	-4.2	-6.8	-2.3	-6.0	-1.0	-7.7	-3.5	-3.6	0.1	0.3	6.0	0.9	5.0	-2.8	-2.2
9 years	-5.9	-6.6	-6.4	-3.2	-5.2	-2.6	-7.4	-5.2	-2.6	-0.7	0.8	4.9	6.6	5.8	-1.2	-2.0
10 years	-7.0	-6.2	-7.6	-6.1	-7.6	-5.0	-7.7	-6.3	-3.8	-3.3	-0.6	2.2	7.6	5.2	0.1	-4.1
11 years	-7.7	-6.3	-9.1	-7.0	-7.8	-4.3	-7.8	-4.8	-4.8	2.3	-2.0	6.0	4.0	6.9	-3.8	1.3
Boys																
Total, 6-11 years . .	-7.5	-5.6	-8.0	-4.3	-6.2	-2.2	-7.8	-4.0	-3.4	0.1	0.5	4.4	4.2	5.3	-1.1	0.7
Girls																
Total, 6-11 years . .	-4.6	-4.2	-4.8	-3.6	-5.2	-2.6	-6.8	-3.9	-2.8	0.9	0.3	5.4	4.0	6.3	-2.8	1.0
Standard error of average, total																
Right	1.40	0.85	1.15	1.10	1.00	1.20	0.90	1.30	1.00	1.10	1.05	1.05	1.55	1.55	0.90	1.75
Left	1.00	0.95	1.05	1.05	0.90	1.15	0.55	0.95	0.90	1.05	0.95	1.10	0.70	1.20	0.70	1.40

Table 20. Average hearing levels in the right and left ear at each test frequency for children 6-11 years of age with a bulging or retracted drum in the test ear, by age and sex, with standard errors of total averages: United States, 1963-65

Ear, age, and sex	250 cps		500 cps		1000 cps		2000 cps		3000 cps		4000 cps		6000 cps		8000 cps	
	Bulging	Retracted	Bulging	Retracted	Bulging	Retracted	Bulging	Retracted	Bulging	Retracted	Bulging	Retracted	Bulging	Retracted	Bulging	Retracted
RIGHT EAR																
Both sexes	Average in decibels re audiometric zero (ASA, 1951)															
Total, 6-11 years . .	-2.2	-4.3	1.0	-2.9	4.5	-1.2	0.7	-4.9	1.0	-0.5	10.5	3.9	7.8	3.9	2.4	0.3
6 years	-10.0	-1.9	-7.5	-1.0	-3.0	-1.3	-2.8	-3.6	-5.2	-0.5	0.8	3.8	5.1	6.3	-8.2	2.2
7 years	-0.5	-3.0	5.9	-1.1	9.0	0.8	2.2	-4.7	1.2	-0.5	16.8	5.6	13.2	3.4	13.0	0.8
8 years	20.0	-2.1	17.5	-1.4	15.0	1.0	17.5	-4.2	25.0	-0.2	25.0	5.5	12.5	4.2	15.0	-0.6
9 years	0.8	-4.7	11.8	-4.6	13.5	-2.0	4.1	-5.2	11.3	-1.9	18.1	1.7	6.8	3.0	1.3	-0.5
10 years	-9.6	-6.3	-12.5	-4.7	-10.4	-2.3	-9.6	-5.8	-5.4	0.0	-0.4	3.5	-6.1	4.0	-5.4	-0.1
11 years	-7.5	-7.5	-2.5	-5.1	7.5	-3.5	-2.5	-6.1	-2.5	-0.4	7.5	3.4	7.5	2.0	-2.5	-0.6
Boys																
Total, 6-11 years . .	-9.2	-4.9	-3.8	-2.9	-5.2	-1.1	-9.1	-4.8	-3.6	0.2	-1.2	3.8	-0.5	4.1	-4.6	0.4
Girls																
Total, 6-11 years . .	4.9	-3.6	6.0	-3.0	14.4	-1.4	10.7	-5.0	5.7	-1.5	22.5	4.0	16.3	3.7	9.5	0.2
LEFT EAR																
Both sexes																
Total, 6-11 years . .	-7.1	-4.2	-4.8	-3.2	-0.4	-1.6	-3.8	-4.9	-1.4	0.3	8.7	4.5	4.7	5.8	2.2	0.9
6 years	1.7	-4.2	1.7	-3.2	11.7	-0.7	5.0	-3.0	-0.8	0.9	16.7	4.9	8.4	5.8	1.7	2.3
7 years	-	-1.5	-	-0.5	-	0.9	-	-4.6	-	0.7	-	5.1	-	4.4	-	1.9
8 years	1.7	-3.8	-3.3	-2.6	-3.3	-1.4	2.5	-4.6	0.0	0.1	14.2	5.7	17.5	4.3	20.0	0.6
9 years	-11.0	-4.0	-5.0	-3.6	-4.0	-2.2	-14.5	-5.4	-2.5	-0.5	4.0	4.1	1.5	7.7	-1.5	0.9
10 years	0.5	-5.7	2.5	-4.1	12.5	-2.3	14.5	-5.3	17.5	0.4	24.5	3.9	17.5	8.0	11.5	0.5
11 years	10.9	-4.9	22.5	-4.4	35.9	-2.6	29.2	-5.7	29.2	1.5	49.2	4.7	35.9	7.0	29.2	0.8
Boys																
Total, 6-11 years . .	-9.1	-4.8	-8.8	-3.8	-3.3	-1.6	-4.6	-4.8	-2.7	0.3	7.1	4.1	0.4	6.5	-0.7	1.1
Girls																
Total, 6-11 years . .	-5.2	-3.5	-1.2	-2.6	2.2	-1.5	-3.0	-5.1	-0.2	0.2	10.2	4.8	8.7	5.0	4.9	0.8
Standard deviation, total																
Right	---	9.36	---	9.89	---	10.28	---	9.17	---	9.37	---	10.92	---	13.06	---	13.88
Left	---	8.46	---	8.98	---	10.11	---	8.22	---	9.71	---	11.48	---	13.14	---	12.96
Standard error of average, total																
Right	4.15	0.60	3.25	0.80	4.60	0.75	4.65	0.75	3.30	0.70	6.10	0.80	4.70	1.10	6.65	1.15
Left	2.70	0.75	3.45	0.75	4.30	0.90	4.85	0.85	4.35	0.80	3.75	0.75	5.90	1.05	6.80	0.95

Table 21. Average hearing levels in the right and left ear at each test frequency for children 6-11 years of age with discoloration of the drum in the test ear, by color, age and sex, with standard errors of total averages: United States, 1963-65

Ear, age, and sex	250 cps		500 cps		1000 cps		2000 cps		3000 cps		4000 cps		6000 cps		8000 cps	
	Red	Other discoloration	Red	Other discoloration	Red	Other discoloration	Red	Other discoloration	Red	Other discoloration	Red	Other discoloration	Red	Other discoloration	Red	Other discoloration
	Average in decibels re audiometric zero (ASA, 1951)															
RIGHT EAR																
Both sexes																
Total, 6-11 years . .	-0.3	-4.8	1.1	-1.9	4.0	-1.5	0.0	-5.0	2.5	1.2	6.9	5.2	10.3	4.2	7.3	-0.6
6 years	1.5	-12.5	4.1	-2.5	4.1	-2.5	0.1	-12.5	3.4	7.5	5.8	-7.5	10.8	-2.5	9.0	-7.5
7 years	4.5	-8.3	3.1	-4.9	8.5	-3.3	2.5	-6.5	4.2	1.3	11.5	5.8	11.3	-0.1	10.3	-2.9
8 years	0.6	4.3	3.3	8.0	4.4	11.8	2.7	3.3	4.1	5.8	10.3	13.3	9.3	18.8	8.2	5.3
9 years	-10.7	-1.7	-11.7	0.9	-8.2	1.1	-7.4	-1.8	-8.4	3.4	-4.9	7.0	2.2	4.2	-6.2	2.5
10 years	-3.3	-7.3	1.4	-7.3	13.1	-6.2	8.4	-9.5	4.7	-3.0	2.4	2.0	24.9	2.2	29.5	5.5
11 years	-2.3	-10.2	-0.2	-7.1	-2.4	-8.8	-7.5	-9.4	-1.8	-3.6	4.0	3.5	14.0	0.8	10.0	-6.2
Boys																
Total, 6-11 years . .	-1.6	-3.6	1.6	-1.5	1.9	-1.4	-0.1	-5.8	3.7	1.5	7.0	2.5	11.1	2.1	6.9	0.1
Girls																
Total, 6-11 years . .	1.2	-6.3	0.6	-2.4	6.0	-1.7	0.0	-4.0	1.2	0.8	6.9	8.7	9.4	6.9	7.7	-1.5
LEFT EAR																
Both sexes																
Total, 6-11 years . .	0.8	-4.5	0.4	-2.9	2.3	-1.7	-3.2	-6.0	2.5	0.6	10.2	2.6	11.9	5.6	6.8	0.3
6 years	4.1	-6.4	0.9	-2.6	1.3	0.3	-3.6	-5.2	0.1	2.3	9.5	1.2	13.2	18.1	7.4	5.7
7 years	7.2	-8.8	6.7	-6.2	6.8	-5.2	2.5	-4.9	3.1	1.4	12.8	4.7	9.0	-0.3	4.5	-1.1
8 years	-1.8	1.8	-0.4	6.0	1.5	6.8	-5.2	-5.4	-1.0	2.5	12.2	6.0	16.5	3.9	10.2	7.5
9 years	-5.4	-10.9	-4.3	-7.0	-5.2	-7.9	-8.6	-2.0	0.4	-2.9	3.8	-0.6	5.2	-0.4	2.0	0.6
10 years	-1.4	-6.3	-5.4	-6.3	1.3	-3.8	-2.3	-8.8	-0.2	-2.6	3.4	-3.8	7.1	-0.1	14.0	-10.1
11 years	-8.5	-1.9	-6.9	-3.6	-0.7	-1.5	-5.5	-5.8	3.1	-3.9	11.2	5.9	9.6	7.6	3.8	-3.1
Boys																
Total, 6-11 years . .	-1.7	-3.7	-1.2	-2.5	0.6	-0.9	-4.7	-5.6	4.0	2.0	9.7	2.6	12.7	3.6	5.1	2.3
Girls																
Total, 6-11 years . .	3.7	-6.3	2.2	-4.2	4.2	-3.6	-1.4	-7.0	0.8	-2.8	10.9	2.5	11.0	10.8	8.8	-4.8
Standard error of average, total																
Right	3.35	2.15	2.85	2.20	3.90	2.90	2.60	2.15	2.10	2.05	3.90	2.50	3.35	3.65	3.65	3.30
Left	2.25	2.15	2.55	1.20	2.60	1.50	1.55	1.50	1.65	2.15	3.15	3.00	2.45	3.55	2.50	3.05

Table 22. Average hearing levels in the right and left ear at each test frequency for children 6-11 years of age with a perforated drum in the test ear, with and without discharge, by age and sex, with standard errors of total averages: United States, 1963-65

Ear, age, and sex	250 cps		500 cps		1000 cps		2000 cps	
	With discharge	Without discharge	With discharge	Without discharge	With discharge	Without discharge	With discharge	Without discharge
RIGHT EAR	Average in decibels re audiometric zero (ASA, 1951)							
Both sexes								
Total, 6-11 years	9.1	8.9	6.1	5.4	9.2	8.2	11.3	8.0
6 years	16.6	20.0	9.0	6.1	6.4	4.3	15.5	15.0
7 years	-0.3	2.5	1.5	2.3	-0.3	7.9	-0.3	4.6
8 years	37.5	-	-	-	42.5	-	37.5	-
9 years	-5.7	21.6	-2.2	25.1	2.8	24.9	-1.6	15.1
10 years	-	6.3	-	1.3	-	3.2	-	3.2
11 years	12.5	-17.5	17.5	-22.5	22.5	-12.5	27.5	-2.5
Boys								
Total, 6-11 years	4.0	0.2	4.4	-0.6	5.3	5.6	6.3	3.8
Girls								
Total, 6-11 years	19.3	16.6	9.4	10.8	17.1	10.5	21.1	11.7
LEFT EAR								
Both sexes								
Total, 6-11 years	8.6	-0.2	10.6	-0.3	12.7	2.0	8.6	-0.7
6 years	5.6	3.2	11.7	1.3	8.6	8.2	8.5	-4.0
7 years	2.8	-12.5	1.9	-7.5	-0.4	-2.5	-0.4	-2.5
8 years	-	-7.8	-	-6.7	-	-4.3	-	-2.4
9 years	-	19.3	-	11.6	-	15.9	-	6.0
10 years	27.5	-	22.5	-	22.5	-	12.5	-
11 years	2.5	22.5	2.5	22.5	20.0	2.5	12.5	12.5
Boys								
Total, 6-11 years	0.8	0.6	3.2	1.2	2.6	2.4	1.4	1.9
Girls								
Total, 6-11 years	11.6	-2.8	13.5	-5.6	16.7	0.6	11.4	-10.1
Standard error of average, total								
Right	6.85	6.55	6.05	5.05	5.00	4.05	7.10	3.10
Left	9.65	5.50	7.90	4.10	8.00	4.85	7.10	2.75

Table 22. Average hearing levels in the right and left ear at each test frequency for children 6-11 years of age with a perforated drum in the test ear, with and without discharge, by age and sex, with standard errors of total averages: United States, 1963-65—Con.

Ear, age and sex	3000 cps		4000 cps		6000 cps		8000 cps	
	With discharge	Without discharge	With discharge	Without discharge	With discharge	Without discharge	With discharge	Without discharge
	Average in decibels re audiometric zero (ASA, 1951)							
RIGHT EAR								
Both sexes								
Total, 6-11 years	17.6	13.8	17.0	13.6	20.3	14.9	12.2	10.2
6 years	30.5	6.1	21.4	5.8	30.1	21.4	27.8	13.6
7 years	4.7	16.4	6.9	14.6	7.9	17.9	-8.5	12.2
8 years	32.5	-	37.5	-	27.5	-	17.5	-
9 years	-1.6	24.9	3.4	25.4	-2.5	15.4	2.8	10.1
10 years	-	12.6	-	19.0	-	3.2	-	6.3
11 years	37.5	-7.5	42.5	-2.5	32.5	-2.5	37.5	-7.5
Boys								
Total, 6-11 years	13.2	13.7	14.3	12.6	21.8	15.5	12.7	9.9
Girls								
Total, 6-11 years	26.3	13.9	22.4	14.5	17.4	14.4	11.1	10.4
LEFT EAR								
Both sexes								
Total, 6-11 years	11.3	7.5	16.6	12.4	24.0	11.3	20.2	8.3
6 years	12.6	3.5	15.6	9.5	14.7	0.8	13.7	2.6
7 years	-0.4	7.5	4.6	7.5	11.6	2.5	-3.4	-7.5
8 years	-	-0.2	-	17.5	-	14.1	-	19.5
9 years	-	18.0	-	15.1	-	27.4	-	15.9
10 years	12.5	-	17.5	-	37.5	-	37.5	-
11 years	17.5	7.5	30.0	22.5	35.0	2.5	35.0	2.5
Boys								
Total, 6-11 years	0.3	8.6	8.8	9.1	15.4	9.5	5.1	5.2
Girls								
Total, 6-11 years	15.7	3.3	19.7	24.5	27.4	17.8	26.2	19.5
Standard error of average, total								
Right	8.25	4.25	8.80	4.25	5.30	4.55	9.45	5.05
Left	9.10	5.00	8.50	5.05	10.70	8.20	12.90	7.30

Table 23. Average hearing levels in the right and left ear at each test frequency for children 6-11 years of age with a scarred drum in the test ear, by age and sex, with standard deviations and standard errors for total averages: United States, 1963-65

Ear, age, and sex	250 cps	500 cps	1000 cps	2000 cps	3000 cps	4000 cps	6000 cps	8000 cps
	Average in decibels re audiometric zero (ASA, 1951)							
RIGHT EAR								
Both sexes								
Total, 6-11 years	-3.6	-3.6	-0.5	-4.4	-0.1	4.3	3.5	2.2
6 years	-3.4	-1.6	2.2	-4.0	1.4	6.0	4.0	3.4
7 years	-4.9	-5.0	-2.2	-7.5	-0.5	3.3	2.5	0.1
8 years	-5.9	-5.0	-1.5	-3.8	-1.9	0.4	3.3	1.0
9 years	3.8	2.3	4.6	2.0	4.9	12.2	9.2	9.1
10 years	-6.4	-8.2	-4.5	-7.1	-4.0	-0.5	1.0	-0.5
11 years	-7.1	-7.1	-3.8	-5.3	-2.8	2.0	0.8	-1.1
Boys								
Total, 6-11 years	-3.0	-2.5	0.4	-3.2	1.1	6.0	4.7	4.5
Girls								
Total, 6-11 years	-4.3	-4.9	-1.7	-5.8	-1.6	2.3	2.2	-0.5
LEFT EAR								
Both sexes								
Total, 6-11 years	-4.2	-2.9	-1.4	-3.8	0.7	6.6	4.3	3.0
6 years	-3.2	-2.4	0.8	-3.6	3.3	7.3	4.7	8.6
7 years	-4.7	-3.7	-4.2	-4.9	0.4	4.6	2.0	-0.3
8 years	-4.8	-2.5	0.3	-0.9	-5.3	11.0	4.2	4.7
9 years	-3.7	-2.0	-1.0	-4.0	-1.1	5.1	3.8	1.5
10 years	-6.2	-5.2	-3.7	-5.3	-0.2	3.1	3.7	0.9
11 years	-1.3	-0.9	-0.3	1.8	2.5	9.4	5.8	1.6
Boys								
Total, 6-11 years	-5.0	-3.3	-1.2	-3.7	0.0	6.9	3.2	3.0
Girls								
Total, 6-11 years	-3.3	-2.4	-1.6	-4.0	1.4	6.4	5.4	3.0
Standard deviation, total								
Right	11.10	10.30	11.58	10.62	10.20	12.14	13.06	13.88
Left	10.14	10.74	12.44	11.58	12.12	13.56	13.83	13.82
Standard error of average, total								
Right	1.20	1.10	0.80	1.05	1.25	1.55	1.60	1.55
Left	1.45	0.95	1.60	1.15	1.50	1.35	1.45	1.55

Table 24. Average hearing levels in the better ear at each test frequency for children 6-11 years of age, by condition of the oral pharynx, age and sex, with standard errors for total averages: United States, 1963-65

Age and sex	250 cps		500 cps		1000 cps	
	Normal	Abnormal	Normal	Abnormal	Normal	Abnormal
	Average in decibels re audiometric zero (ASA, 1951)					
Both sexes						
Total, 6-11 years	-9.6	-8.8	-9.1	-7.6	-7.9	-6.7
6 years	-7.5	-7.1	-7.4	-6.0	-6.8	-5.5
7 years	-8.4	-7.1	-7.8	-6.0	-7.1	-5.0
8 years	-9.9	-9.4	-9.1	-8.3	-7.6	-7.1
9 years	-9.9	-8.9	-9.5	-7.5	-8.2	-6.9
10 years	-10.9	-9.5	-10.6	-8.6	-9.1	-7.2
11 years	-11.0	-10.9	-10.5	-9.7	-9.1	-9.1
Boys						
Total, 6-11 years	-9.9	-8.9	-9.0	-7.4	-7.7	-6.2
6 years	-7.7	-6.7	-7.4	-4.7	-6.6	-3.7
7 years	-8.7	-7.5	-7.6	-5.8	-6.8	-4.5
8 years	-9.9	-8.6	-8.6	-7.0	-7.2	-5.4
9 years	-10.5	-9.4	-9.7	-8.3	-8.5	-6.8
10 years	-11.3	-9.4	-10.3	-8.0	-8.7	-6.7
11 years	-11.3	-12.0	-10.5	-11.0	-8.8	-10.2
Girls						
Total, 6-11 years	-9.2	-8.6	-9.2	-7.9	-8.1	-7.4
6 years	-7.2	-7.5	-7.4	-7.3	-6.9	-7.3
7 years	-8.0	-6.6	-7.9	-6.2	-7.3	-5.4
8 years	-9.8	-10.1	-9.7	-9.5	-7.9	-8.8
9 years	-9.2	-8.4	-9.2	-6.8	-7.8	-7.0
10 years	-10.5	-9.6	-10.9	-9.1	-9.5	-7.6
11 years	-10.7	-9.7	-10.4	-8.4	-9.4	-8.1
Standard error of average, total	0.15	0.45	0.30	0.65	0.25	0.60

Table 24. Average hearing levels in the better ear at each test frequency for children 6-11 years of age, by condition of the oral pharynx, age and sex, with standard errors for total averages: United States, 1963-65—Con.

2000 cps		3000 cps		4000 cps		6000 cps		8000 cps		Speech[1]	
Normal	Abnormal	Normal	Abnormal	Normal	Abnormal	Normal	Abnormal	Normal	Abnormal	Normal	Abnormal
Average in decibels re audiometric zero (ASA, 1951)											
-9.2	-8.7	-5.2	-4.3	-2.1	-1.0	-2.7	-1.6	-6.1	-5.8	-8.7	-7.8
-8.3	-7.7	-4.9	-3.0	-1.5	0.2	-2.3	-0.2	-4.6	-4.0	-7.5	-6.7
-8.8	-7.5	-4.6	-3.5	-1.6	-0.1	-2.3	-1.2	-5.7	-5.0	-7.9	-6.3
-9.4	-8.5	-5.4	-4.7	-2.0	-1.4	-3.6	-1.5	-6.7	-7.0	-8.7	-7.9
-9.3	-9.9	-5.1	-4.4	-2.2	-1.0	-2.6	-2.4	-6.6	-6.5	-9.0	-8.2
-9.9	-8.9	-5.9	-4.8	-3.1	-2.0	-3.0	-2.9	-6.7	-6.5	-9.9	-8.3
-9.5	-9.7	-5.4	-6.0	-2.7	-2.3	-2.5	-1.6	-6.7	-6.4	-9.7	-9.7
-8.9	-8.2	-4.9	-3.7	-2.0	-0.2	-2.4	-1.2	-5.8	-5.0	-8.6	-7.4
-8.0	-7.2	-4.2	-1.6	-1.5	2.5	-2.3	1.7	-3.9	-2.0	-7.3	-5.3
-8.6	-6.7	-4.2	-2.7	-1.2	0.0	-2.1	-0.8	-5.7	-4.6	-7.6	-5.8
-9.1	-7.6	-5.0	-3.2	-2.1	0.2	-3.1	-0.4	-6.0	-5.2	-8.3	-6.9
-9.2	-9.6	-5.3	-4.7	-2.4	-0.3	-2.6	-2.6	-6.7	-6.3	-9.2	-8.3
-9.6	-8.0	-5.6	-4.0	-2.6	-1.4	-2.5	-2.4	-6.5	-5.3	-9.6	-7.4
-9.1	-9.9	-5.0	-5.8	-2.4	-2.6	-1.9	-2.7	-6.1	-6.8	-9.5	-10.6
-9.4	-9.2	-5.5	-5.0	-2.3	-1.9	-3.0	-2.0	-6.4	-6.7	-8.9	-8.2
-8.6	-8.1	-5.5	-4.3	-1.4	-2.0	-2.3	-2.1	-5.3	-5.9	-7.7	-8.1
-8.9	-8.3	-4.9	-4.2	-1.9	-0.1	-2.5	-1.5	-5.7	-5.3	-8.1	-6.7
-9.7	-9.3	-5.7	-6.2	-1.9	-2.9	-4.0	-2.6	-7.3	-8.8	-9.0	-8.8
-9.4	-10.1	-5.0	-4.2	-2.0	-1.6	-2.6	-2.2	-6.5	-6.7	-8.8	-8.0
-10.1	-10.0	-6.2	-5.6	-3.6	-2.6	-3.4	-3.3	-6.8	-7.7	-10.2	-9.1
-9.9	-9.4	-5.8	-6.1	-2.9	-1.9	-3.0	-0.4	-7.2	-6.1	-9.9	-8.7
0.20	0.50	0.35	0.65	0.35	0.65	0.40	0.55	0.25	0.55	0.25	0.50

[1] Estimate based on average at 500, 1000, and 2000 cycles.

Table 25. Average hearing levels in the better ear at each test frequency for children 6-11 years of age with hypertropic lympoid tissue in the oral pharynx, by age and sex, with standard errors for total averages: United States, 1963-65

Age and sex	250 cps	500 cps	1000 cps	2000 cps	3000 cps	4000 cps	6000 cps	8000 cps
Both sexes	Average in decibels re audiometric zero (ASA, 1951)							
Total, 6-11 years	-9.1	-7.9	-7.0	-8.8	-4.5	-1.2	-1.7	-6.3
6 years	-7.3	-5.6	-5.6	-6.9	-2.7	-0.1	0.7	-3.9
7 years	-7.0	-6.1	-5.1	-7.5	-3.4	-0.1	-1.4	-5.4
8 years	-10.2	-8.7	-7.1	-9.0	-5.2	-2.1	-2.1	-7.4
9 years	-8.8	-7.6	-6.4	-9.9	-4.5	-0.6	-2.7	-7.5
10 years	-9.6	-9.0	-8.0	-9.5	-4.9	-1.8	-3.1	-7.4
11 years	-11.2	-10.3	-9.5	-9.9	-6.0	-2.2	-1.4	-6.1
Boys								
Total, 6-11 years	-9.4	-8.0	-6.7	-8.4	-3.8	-0.5	-1.3	-5.6
6 years	-6.6	-4.2	-4.0	-6.2	-1.5	1.6	2.5	-2.5
7 years	-8.1	-6.5	-5.2	-6.8	-3.0	-0.6	-1.8	-5.6
8 years	-9.4	-7.2	-5.4	-7.7	-3.1	-0.5	-0.9	-5.3
9 years	-10.0	-8.9	-6.6	-10.2	-5.3	-0.3	-3.3	-8.3
10 years	-9.0	-8.3	-7.3	-8.7	-3.6	-0.3	-1.9	-5.0
11 years	-12.4	-12.0	-10.9	-10.2	-5.7	-2.6	-2.3	-6.3
Girls								
Total, 6-11 years	-8.7	-7.9	-7.3	-9.2	-5.1	-1.8	-2.0	-7.0
6 years	-7.9	-7.1	-7.2	-7.5	-3.8	-1.8	-1.0	-5.2
7 years	-5.9	-5.7	-5.0	-8.1	-3.8	0.5	-0.9	-5.1
8 years	-10.9	-10.2	-8.9	-10.2	-7.2	-3.7	-3.3	-9.5
9 years	-7.5	-6.2	-6.2	-9.6	-3.6	-0.8	-2.0	-6.6
10 years	-10.3	-9.7	-8.6	-10.3	-6.2	-3.2	-4.2	-9.8
11 years	-9.9	-8.5	-8.0	-9.5	-6.3	-1.8	-0.5	-6.0
Standard error of average, total	0.65	0.80	0.75	0.65	0.80	0.75	0.60	0.65

Table 26. Average hearing levels in the right and left ear, by condition of the right and left nasal passage, age and sex, with standard errors for total averages: United States, 1963-65

Ear, side of nasal passage, age, and sex	250 cps		500 cps		1000 cps		2000 cps	
	Normal	Abnormal	Normal	Abnormal	Normal	Abnormal	Normal	Abnormal
RIGHT EAR—RIGHT NOSTRIL	Average in decibels re audiometric zero (ASA, 1951)							
Both sexes								
Total, 6-11 years	-7.8	-7.2	-7.2	-6.2	-6.0	-4.8	-7.0	-6.6
6 years	-5.2	-5.3	-5.0	-4.2	-4.4	-3.4	-6.0	-5.6
7 years	-7.0	-5.6	-6.4	-4.1	-5.5	-2.8	-6.8	-6.1
8 years	-8.0	-8.0	-7.5	-6.6	-5.5	-5.0	-7.2	-6.7
9 years	-8.2	-7.7	-7.4	-7.0	-6.0	-5.5	-7.2	-7.2
10 years	-9.0	-8.2	-8.6	-8.0	-7.0	-6.4	-7.4	-7.2
11 years	-9.4	-9.2	-8.8	-8.2	-7.4	-6.6	-7.4	-7.4
Boys								
Total, 6-11 years	-8.2	-7.6	-7.3	-6.0	-5.9	-4.8	-7.0	-6.2
Girls								
Total, 6-11 years	-7.3	-6.8	-7.2	-6.4	-6.0	-5.0	-7.0	-7.0
Standard error of average, total	0.10	0.40	0.25	0.40	0.20	0.35	0.25	0.35
LEFT EAR—LEFT NOSTRIL								
Both sexes								
Total, 6-11 years	-7.3	-6.3	-7.1	-5.9	-6.0	-4.7	-6.8	-6.1
6 years	-5.2	-5.0	-5.4	-4.7	-4.6	-3.4	-5.8	-5.6
7 years	-6.5	-4.4	-6.1	-4.1	-5.3	-2.9	-6.1	-5.9
8 years	-8.0	-6.1	-7.3	-5.4	-6.0	-4.1	-7.3	-5.2
9 years	-7.5	-6.8	-7.2	-6.0	-6.0	-5.7	-7.2	-6.8
10 years	-8.5	-7.7	-8.3	-7.7	-7.0	-6.0	-7.4	-6.6
11 years	-8.6	-8.7	-8.3	-8.5	-7.0	-7.1	-7.3	-7.5
Boys								
Total, 6-11 years	-7.7	-6.7	-7.0	-5.8	-5.8	-4.2	-6.5	-5.6
Girls								
Total, 6-11 years	-7.0	-5.9	-7.2	-6.1	-6.2	-5.2	-7.1	-6.8
Standard error of average, total	0.20	0.45	0.30	0.50	0.30	0.40	0.20	0.35

Table 26. Average hearing levels in the right and left ear, by condition of the right and left nasal passage, age and sex, with standard errors for total averages: United States, 1963-65—Con.

Ear, side of nasal passage, age, and sex	3000 cps		4000 cps		6000 cps		8000 cps	
	Normal	Abnormal	Normal	Abnormal	Normal	Abnormal	Normal	Abnormal
RIGHT EAR—RIGHT NOSTRIL	Average in decibels re audiometric zero (ASA, 1951)							
Both sexes								
Total, 6-11 years	-3.2	-2.2	0.5	1.7	0.6	0.6	-2.8	-2.4
6 years	-2.8	-1.7	1.4	2.8	1.4	1.5	-1.1	-1.3
7 years	-2.8	-1.5	0.8	3.0	0.8	1.2	-2.4	-0.4
8 years	-3.5	-2.4	0.5	1.2	-0.4	0.6	-3.4	-2.9
9 years	-3.2	-2.2	0.4	1.7	0.6	0.2	-3.4	-3.6
10 years	-3.6	-3.3	0.0	0.6	0.3	-0.4	-3.0	-4.5
11 years	-3.6	-2.6	-0.1	0.8	0.8	-0.2	-3.2	-2.5
Boys								
Total, 6-11 years	-3.0	-1.7	0.6	1.8	0.8	0.8	-2.4	-2.1
Girls								
Total, 6-11 years	-3.4	-2.8	0.4	1.6	0.4	0.2	-3.0	-2.8
Standard error of average, total	0.40	0.50	0.35	0.40	0.35	0.65	0.30	0.40
LEFT EAR—LEFT NOSTRIL								
Both sexes								
Total, 6-11 years	-2.9	-1.6	0.7	2.3	1.5	2.4	-2.8	-2.4
6 years	-2.3	-1.1	1.6	2.9	1.6	2.2	-0.9	-2.3
7 years	-2.3	-1.1	1.4	3.6	1.5	3.2	-2.8	-1.5
8 years	-3.4	-0.9	0.8	3.2	0.2	2.9	-3.8	-1.5
9 years	-2.9	-2.3	0.7	1.2	1.9	1.6	-2.8	-4.1
10 years	-3.6	-2.8	-0.5	0.8	1.3	1.7	-3.2	-3.1
11 years	-3.2	-2.3	0.5	1.4	2.6	2.4	-3.1	-1.7
Boys								
Total, 6-11 years	-2.7	-1.0	0.9	2.6	1.9	2.9	-2.4	-1.9
Girls								
Total, 6-11 years	-3.2	-2.3	0.5	1.9	1.2	1.8	-3.1	-3.1
Standard error of average, total	0.35	0.55	0.40	0.40	0.40	0.65	0.30	0.55

Table 27. Prevalence rates and average hearing levels at each test frequency for children 6-11 years of age with other abnormalities of the oral pharynx and nose, with standard errors for rates and averages: United States, 1963-65

Measure	Conditions of oral pharynx				Conditions of the nasal passages					
	Cleft palate			Heavy post nasal discharge	Deviated septum		Hypertrophied turbinates		Obstruction	
	Total	Repaired	Un-repaired		Right	Left	Right	Left	Right	Left
Prevalence rate per 100 children	0.2	0.2	0.0	1.9	2.6	2.7	8.0	8.2	1.6	1.4
Average hearing levels (better ear for conditions of oral pharynx, respective ear for others) re audiometric zero (ASA, 1951) at:										
250 cycles	-6.0	-4.1	-12.5	-7.9	-9.0	-7.4	-7.3	-6.6	-6.2	-4.1
500 cycles	-5.2	-4.6	-7.5	-6.6	-7.5	-7.3	-6.4	-6.0	-4.7	-3.8
1000 cycles	-2.0	-0.9	-5.7	-6.2	-6.4	-5.7	-4.8	-4.8	-3.2	-2.6
2000 cycles	-5.8	-4.3	-10.9	-8.8	-7.9	-7.2	-6.7	-6.0	-5.9	-4.9
3000 cycles	1.9	1.7	2.5	-4.3	-3.9	-3.4	-2.2	-1.7	-2.2	-1.8
4000 cycles	0.8	3.1	-7.5	-0.6	0.4	1.3	1.8	2.2	2.1	2.6
6000 cycles	4.0	5.4	-0.7	-1.5	-1.1	0.9	0.1	2.1	0.5	2.0
8000 cycles	1.0	1.9	-2.3	-4.7	-3.4	-3.1	-2.7	-2.7	-3.3	-2.2
Standard errors for:										
Rates (percent)	*	*	*	0.37	0.18	0.20	1.60	1.60	0.45	0.35
Averages (dB)	3.00	3.70	20.00	0.90	0.60	0.60	0.60	0.80	0.85	1.40

Table 28. Average hearing levels in the better ear for children 6-11 years, by condition of tonsils, age and sex, with standard errors for total averages: United States, 1963-65

Condition of tonsils, age, and sex	Frequency in cycles per second							
	250	500	1000	2000	3000	4000	6000	8000
	Hearing levels in decibels re audiometric zero (ASA, 1951)							
TONSILS REMOVED								
Both sexes								
Total, 6-11 years	-9.8	-9.6	-8.4	-9.5	-5.6	-3.0	-2.4	-5.8
6 years	-7.0	-7.6	-7.2	-8.1	-4.6	-2.0	-0.5	-1.9
7 years	-8.8	-8.4	-6.7	-8.6	-4.6	-1.5	-2.2	-5.4
8 years	-10.6	-9.5	-8.3	-10.0	-6.4	-3.2	-3.5	-6.4
9 years	-9.9	-9.6	-8.4	-9.4	-5.4	-3.3	-3.2	-7.0
10 years	-11.0	-10.4	-8.8	-10.4	-6.2	-3.2	-2.4	-5.8
11 years	-10.7	-11.0	-10.0	-9.8	-5.8	-3.8	-1.9	-6.6
Boys								
Total, 6-11 years	-10.2	-9.4	-7.8	-9.3	-5.0	-2.4	-2.1	-5.7
Girls								
Total, 6-11 years	-9.4	-9.8	-9.1	-9.7	-6.4	-3.6	-2.8	-5.8
Standard error, total	0.20	0.35	0.25	0.25	0.55	0.50	0.45	0.45
TONSILLAR TAGS								
Both sexes								
Total, 6-11 years	-10.2	-9.6	-8.6	-9.8	-5.8	-3.0	-2.9	-6.6
6 years	-7.6	-6.8	-7.0	-8.0	-5.0	-1.6	-2.0	-4.3
7 years	-9.4	-8.4	-7.5	-9.7	-5.4	-2.8	-2.5	-6.0
8 years	-9.6	-9.2	-7.8	-9.2	-5.2	-2.4	-3.4	-6.1
9 years	-10.1	-9.8	-9.8	-10.4	-6.0	-3.3	-3.0	-7.2
10 years	-12.4	-11.7	-10.4	-11.2	-6.8	-4.2	-3.4	-7.7
11 years	-10.8	-10.5	-8.2	-9.5	-6.0	-3.4	-2.8	-7.2
Boys								
Total, 6-11 years	-10.8	-9.6	-8.6	-9.7	-6.2	-3.2	-3.0	-6.8
Girls								
Total, 6-11 years	-9.4	-9.6	-8.5	-9.8	-5.2	-2.8	-2.9	-6.2
Standard error, total	0.25	0.35	0.50	0.35	0.40	0.35	0.55	0.55

Table 28. Average hearing levels in the better ear for children 6-11 years,by condition of tonsils, age and sex, with standard errors for total averages: United States, 1963-65—Con.

Condition of tonsils, age, and sex	Frequency in cycles per second							
	250	500	1000	2000	3000	4000	6000	8000
	Hearing levels in decibels re audiometric zero (ASA, 1951)							
TONSILS—GRADE I								
Both sexes								
Total, 6-11 years	-9.4	-8.8	-7.6	-9.1	-5.0	-1.8	-2.4	-6.4
6 years	-7.6	-7.3	-6.5	-8.4	-4.6	-1.0	-2.2	-5.2
7 years	-8.0	-7.2	-6.7	-8.4	-4.3	-1.5	-1.8	-5.9
8 years	-9.7	-8.9	-7.1	-9.3	-5.3	-1.8	-3.0	-7.0
9 years	-9.6	-8.9	-7.3	-9.4	-4.8	-1.8	-2.3	-6.5
10 years	-11.0	-10.3	-12.2	-9.6	-5.6	-2.8	-2.9	-7.0
11 years	-11.1	-10.2	-9.1	-9.7	-5.4	-2.3	-2.4	-7.0
Boys								
Total, 6-11 years	-9.7	-8.6	-7.4	-8.7	-4.6	-1.8	-2.0	-5.8
Girls								
Total, 6-11 years	-9.2	-9.0	-7.8	-9.5	-5.4	-1.9	-2.8	-7.0
Standard error, total	0.15	0.25	0.25	0.20	0.35	0.30	0.40	0.30
TONSILS—GRADE II								
Both sexes								
Total, 6-11 years	-9.3	-9.0	-7.8	-9.0	-5.0	-1.7	-2.8	-5.8
6 years	-7.4	-7.3	-6.8	-8.3	-4.7	-1.4	-2.4	-4.8
7 years	-8.4	-8.0	-7.3	-9.0	-4.6	-1.2	-2.8	-5.4
8 years	-9.8	-9.2	-7.6	-9.1	-4.8	-1.4	-3.8	-6.5
9 years	-9.8	-9.3	-8.2	-9.2	-4.8	-1.5	-2.4	-1.4
10 years	-10.2	-10.3	-8.6	-9.4	-5.8	-2.9	-3.2	-6.4
11 years	-11.2	-10.4	-9.0	-9.2	-5.2	-2.3	-2.8	-6.0
Boys								
Total, 6-11 years	-9.4	-8.8	-7.6	-8.8	-4.5	-1.4	-2.7	-5.5
Girls								
Total, 6-11 years	-9.2	-9.1	-8.1	-9.4	-5.4	-2.1	-3.0	-6.2
Standard error, total	0.25	0.40	0.40	0.30	0.45	0.45	0.50	0.35

Table 28. Average hearing levels in the better ear for children 6-11 years,by condition of tonsils, age and sex, with standard errors for total averages: United States, 1963-65—Con.

Condition of tonsils, age, and sex	Frequency in cycles per second							
	250	500	1000	2000	3000	4000	6000	8000
TONSILS—GRADE III	Hearing levels in decibels re audiometric zero (ASA, 1951)							
Both sexes								
Total, 6-11 years	−7.6	−6.4	−4.9	−7.8	−3.9	−0.4	−2.8	−5.0
6 years	−4.6	−4.6	−2.4	−6.2	−3.4	0.2	−1.6	−2.4
7 years	−4.9	−2.1	−2.1	−6.4	−1.4	0.1	−1.0	−3.7
8 years	−10.6	−7.8	−6.4	−7.6	−4.6	0.0	−6.2	−10.2
9 years	−13.0	−12.0	−9.4	−13.6	−11.3	−3.2	−9.7	−7.0
10 years	−9.4	−9.2	−6.8	−7.0	−1.7	0.0	−3.2	−4.3
11 years	−9.5	−9.6	−9.2	−11.0	−3.4	−1.3	6.4	−6.2
Boys								
Total, 6-11 years	−8.9	−6.4	−4.2	−6.4	−1.8	1.1	−0.4	−3.2
Girls								
Total, 6-11 years	−6.4	−6.3	−5.6	−9.2	−5.8	−1.9	−5.0	−6.5
Standard error, total	1.05	1.25	1.25	0.80	1.00	0.75	1.10	0.80

Table 29. Prevalence of selected otological findings in one or both ears and the average hearing levels of these children 6-11 years of age at 1000 and 4000 cycles per second, with standard errors for averages: United States, 1963-65

Ear-throat findings	Number of children 6-11 years		Average hearing level in test ear at				Standard errors of average hearing levels			
			1000 cps		4000 cps		1000 cps		4000 cps	
	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left
	Number in thousands		Decibels re audiometric zero (ASA, 1951)							
Both ears normal	15,304	15,304	−6.6	−6.4	−0.2	0.2	0.20	0.30	0.35	0.45
Test ear normal, other abnormal	284	296	−5.4	−5.7	1.2	2.8	1.00	0.55	1.40	1.35
Test eardrum normal	18,171	18,167	−6.3	−6.3	0.2	0.5	0.20	0.20	0.35	0.35
Both drums normal	16,567	16,567	−6.4	−6.4	0.0	0.4	0.20	0.30	0.35	0.40
Test eardrum normal, other not visible	844	911	−5.1	−6.4	1.4	1.6	0.50	0.45	0.55	0.45
Test eardrum abnormal	3,203	3,254	−2.8	−3.3	3.1	3.2	0.55	0.55	0.60	0.60
Both drums abnormal	2,307	2,307	−3.0	−3.6	2.9	2.9	0.60	0.65	0.60	0.60
Test eardrum abnormal, other normal	689	751	−3.4	−2.6	3.0	4.0	0.50	1.05	0.90	1.25
Test eardrum perforated	78	85	8.6	6.0	14.8	14.0	2.95	4.05	3.75	3.70
Both drums perforated	18	18	−1.5	−3.5	5.6	5.5	15.15	14.00	19.65	17.10
Test eardrum perforated, other normal	19	38	13.9	13.0	22.8	17.4	10.20	5.70	9.65	4.10
Test eardrum not mobile	1,129	1,051	−0.3	−1.7	4.4	4.7	1.20	1.25	1.00	1.25
Both drums not mobile	584	584	−1.7	−2.0	2.8	4.2	1.20	1.50	2.20	1.50
Test eardrum not mobile, other normal	502	452	−2.6	−3.7	2.6	3.2	1.10	1.75	0.95	1.30
Test eardrum retracted	1,458	1,453	−1.2	−1.6	3.9	4.5	0.75	0.90	0.80	0.75
Both drums retracted	960	960	−1.3	−2.0	3.6	3.9	0.95	0.90	0.90	1.50
Test eardrum retracted, other normal	332	312	−2.0	−1.0	3.0	4.4	0.90	1.35	1.10	1.00
Test eardrum discolored	357	337	2.4	1.2	6.4	8.1	2.65	1.85	2.70	2.20
Both drums discolored	148	148	0.7	1.6	4.0	7.2	5.40	5.95	5.65	4.60
Test eardrum discolored, other normal	109	134	−3.0	0.8	5.2	8.0	2.20	1.80	2.00	2.80
Test eardrum scarred	380	424	−0.5	−1.4	4.3	6.6	0.80	1.60	1.55	1.35
Both drums scarred	195	195	−0.6	−0.6	4.3	6.0	1.00	2.35	1.55	1.90
Test eardrum scarred, other normal	101	114	−0.6	−1.4	4.3	6.6	1.40	1.60	1.55	1.35
Cleft palate with:										
Test eardrum normal	18,171	18,167	−6.4	−6.3	0.2	0.5	0.20	0.30	0.35	0.40
Test eardrum abnormal	3,203	3,254	−2.8	−3.4	3.1	3.2	0.55	0.65	0.60	0.65
Test eardrum not visible	2,376	2,321	−5.0	−4.8	2.2	2.2	0.30	0.50	0.40	0.55

Table 30. Prevalence rates for abnormalities of the ear, nose and throat for U.S. children 6-11 years of age 1963-65 and Pittsburgh children 5-14 years of age in 1958-60

Site and condition	United States ages 6-11 years		Pittsburgh ages 5-14 years	
	Right	Left	Right	Left
External ear and surrounding area	Rate per 100 children			
Congenital defects of pinna	0.8	0.8	0.2	0.1
Auricular region abnormalities:				
Posterior	0.2	0.2	0.0	0.0
Anterior	0.3	0.3	0.0	0.0
Auditory canal				
Abnormalities, total	15.7	15.4	8.8	10.1
Occluded:				
Partially	7.9	8.2	1.1	1.4
Completely	7.5	6.9	7.2	7.9
Inner ear and tympanic membrane				
Drum:				
Not visible	10.1	9.8	8.7	9.8
Not mobile	4.7	4.0	3.9	3.3
Dull	5.7	5.6	3.9	4.4
Transparent	3.4	3.6	19.4	18.7
Opaque	2.8	3.1	5.0	4.5
Bulging	0.4	0.2	0.1	0.1
Retracted	6.0	6.1	8.2	9.3
Red	1.2	1.1	0.6	0.8
Other discoloration	0.5	0.5	0.5	0.4
Perforated:				
With discharge	0.1	0.2	0.1	0.2
Without discharge	0.3	0.2	0.3	0.4
Scars	1.8	1.8	3.8	2.6
Nose				
Deviated septum	2.6	2.7	1.1	1.3
Hypertrophy of turbinates	8.0	8.2	0.5	0.6
Polyps	0.1	0.0	0.0	0.0
Obstruction	1.6	1.4	2.7	3.0
Profuse discharge	5.6		9.3	
Swollen tissue	9.2		0.8	
Oral pharynx				
Cleft palate	0.2		0.2	
Tonsils:				
Removed	13.9		25.1	
Tags	9.6		6.7	
Grade I	41.5		21.3	
Grade II	33.9		41.7	
Grade III	1.2		4.6	
Hypertrophic lymphoid tissue	7.4		10.4	
Heavy postnasal discharge	1.9		0.7	

Table 31. Mean hearing levels among children 6-11 years of age in the United States and children 5-14 years of age in Pittsburgh with abnormalities of the tympanic membrane observed in one or both ears, by frequency and ear tested

Ear and otoscopic finding	Study	Frequency in cycles per second						
		250	500	1000	2000	4000	6000	8000
		Decibels re audiometric zero (ASA, 1951)						
Right ear								
Normal	United States	[1]−8.1	[1]−7.5	[1]−6.3	[1]−7.5	[1]0.2	0.1	−3.3
	Pittsburgh	−6.5	−4.9	−2.7	−1.8	−1.0	0.4	−0.2
Drum not visible	United States	−7.0	−6.4	[1]−5.0	[1]−4.8	[1]2.3	1.1	−1.0
	Pittsburgh	−6.8	−4.4	−2.3	−1.1	−1.0	−0.6	0.2
Perforated drum	United States	[1]9.0	5.6	8.6	9.1	[1]15.1	[1]14.8	10.9
	Pittsburgh	1.3	5.1	6.0	7.4	7.5	3.8	6.9
Impaired mobility of drum	United States	−4.0	−2.2	[1]−0.3	[1]−4.3	4.4	5.0	[1]0.6
	Pittsburgh	−3.1	−0.5	2.7	0.8	3.5	6.0	4.9
Retracted drum	United States	[1]−4.3	[1]−2.9	[1]−1.2	[1]−4.9	3.9	[1]3.9	[1]0.3
	Pittsburgh	−0.7	2.3	3.8	2.4	5.8	7.0	6.6
Left ear								
Normal	United States	−7.7	−7.3	[1]−6.3	[1]−7.1	[1]0.5	1.0	[1]−3.3
	Pittsburgh	−7.4	[1]−4.3	−2.2	−2.2	−0.8	0.9	0.0
Drum not visible	United States	−6.0	−6.1	[1]−4.8	[1]−4.7	[1]2.2	[1]3.1	−0.9
	Pittsburgh	−7.9	−4.9	−2.6	−1.4	−1.0	−0.8	0.4
Perforated drum	United States	3.2	[1]3.8	6.0	[1]2.8	14.0	16.1	12.8
	Pittsburgh	2.8	9.1	10.7	7.9	10.6	14.1	12.6
Impaired mobility of drum	United States	[1]−4.5	[1]−3.5	[1]−1.7	[1]−0.1	[1]4.7	[1]5.2	[1]1.3
	Pittsburgh	0.8	2.9	6.6	3.3	7.6	13.2	9.2
Retracted drum	United States	−4.2	[1]−3.2	[1]−1.6	0.3	4.5	5.8	[1]0.9
	Pittsburgh	−3.0	1.1	3.6	2.1	4.8	6.4	6.1

[1] Mean differences between study groups statistically significant at the 5-percent level.

APPENDIX I
STATISTICAL NOTES

The Survey Design

The sample design for the second cycle of the Health Examination Survey, similar to the one used for the first cycle, was that of a multistage, stratified probability sample of loose clusters of persons in land-based segments. Successive elements dealt with in the process of sampling are primary sampling unit (PSU), census enumeration district (ED), segment, household, eligible child (EC), and finally, the sample child (SC).

At the first stage, the nearly 2000 PSU's into which the United States (including Hawaii and Alaska) had been divided and then grouped into 357 strata for use in the Current Population Survey and the Health Interview Survey were further grouped into 40 superstrata for use in Cycle II of the Health Examination Survey. The average size of each Cycle II stratum was 4.5 million persons, and all strata fell between the limits of 3.5 and 5.5 million. Grouping into 40 strata was done in a way that maximized homogeneity of the PSU's included in each stratum, particularly with regard to the degree of urbanization, geographic proximity, and degree of industrialization. The 40 strata were classified into four broad geographic regions (each with 10 strata) of approximately equal population and cross-classified into four broad population density groups (each having 10 strata). Each of the 16 cells contained either two or three strata. A single stratum might include only one PSU, only part of a PSU (e.g., New York City which represented two strata), or several score PSU's.

To take account of the possible effect that the rate of population change between the 1950 and 1960 Census might have had on health, the 10 strata within each region were further classified into four classes ranging from those with no increase to those with the greatest relative increase. Each such class contained either two or three strata.

One PSU was then selected from each of the 40 strata. A controlled selection technique was used in which the probability of selection of a particular PSU was proportional to its 1960 population. In the controlled selection an attempt was also made to maximize the spread of the PSU's among the States. While not every one of the 64 cells in the 4x4x4 grid contributes a PSU to the sample of 40 PSU's, the controlled selection technique ensured the sample's matching the marginal distributions in all three dimensions and being closely representative of all cross-classifications.

Generally, within a particular PSU, 20 ED's were selected with the probability of selection of a particular ED proportional to its population in the age group 5-9 years in the 1960 Census, which by 1963 roughly approximated the population in the target age group for Cycle II. A similar method was used for selecting one segment (clusters of households) in each ED. Each of the resultant 20 segments was either a bounded area or a cluster of households (or addresses). All of the children in the age range properly resident at the address visited were EC's. Operational considerations made it necessary to reduce the number of prospective examinees at any one location to a maximum of 200. The EC's to be excluded for this reason from the SC group were determined by systematic subsampling.

The total sample included 7,417 children from 25 different States in the age group 6-11 years with approximately 1,000 in each of the single years of age.

Reliability

Measurement processes employed in the survey were highly standardized and closely con-

trolled. Of course this does not mean that the correspondence between the real world and the survey results is exact. Data from the survey are imperfect for three major reasons: (1) results are subject to sampling error, (2) the actual conduct of a survey never agrees perfectly with the design, and (3) the measurement processes themselves are inexact even though standardized and controlled.

The first report on Cycle II[4] describes in detail the faithfulness with which the sampling design was carried out. It notes that out of the 7,417 sample children the 7,119 who were examined—a response rate of 96 percent—gave evidence that they were a highly representative sample of children of this age in the noninstitutional population of the United States. The response levels for the various demographic subgroups—including those for age, sex, race, region, population density, parent's educational level and family income—show no marked differentials. Hence it appears unlikely that nonresponse could bias the findings much in these respects.

Measures used to control the quality of data from this survey in general have been cited previously;[4] those relating specifically to the ear, nose, and throat examination and hearing tests are outlined in an earlier section of this report.

Data recorded for each sample child are inflated in the estimation process to characterize the larger universe of which the sample child is representative. The weights used in this inflation process are a product of the reciprocal of the probability of selecting the child, an adjustment for nonresponse cases, and a poststratified ratio adjustment which increases precision by bringing survey results into closer alignment with known U.S. population figures by color and sex within single years of age 6-11.

In the second cycle of the Health Examination Survey, the sample was the result of three stages of selection—the single PSU from each stratum, the 20 segments from each sample PSU, and the sample children from the eligible children. The probability of selecting an individual child is the product of the probability of selection at each stage.

Since the strata are roughly equal in population size and a nearly equal number of sample children were examined in each of the sample PSU's, the sample design is essentially self-weighting with respect to the target population; that is, each child 6-11 years had about the same probability of being drawn into the sample.

The adjustment upward for nonresponse is intended to minimize the impact of nonresponse on final estimates by imputing to nonrespondents the characteristics of "similar" respondents. Here "similar" respondents were judged to be examined children in a sample PSU having the same age (in years) and sex as children not examined in that sample PSU.

The poststratified ratio adjustment used in the second cycle achieved most of the gains in precision which would have been attained if the sample had been drawn from a population stratified by age, color, and sex and made the final sample estimates of population agree exactly with independent controls prepared by the Bureau of the Census for the noninstitutional population of the United States as of August 1, 1964 (approximate midsurvey point), by color and sex for each single year of age 6 through 11. The weights of every responding sample child in each of the 24 age, color, and sex classes is adjusted upward or downward so that the weighted total within the class equals the independent population control.

Sampling and Measurement Error

In the present report, reference has been made to efforts to minimize bias and variability of measurement techniques.

The probability design of the survey makes possible the calculation of sampling errors. The sampling error is used here to determine how imprecise the survey test results may be because they come from a sample rather than from the measurements of all elements in the universe.

The estimation of sampling errors for a study of the type of the Health Examination Survey is difficult for at least three reasons: (1) measurement error and "pure" sampling error are confounded in the data—it is not easy to find a procedure which will either completely include both or treat one or the other separately, (2) the survey design and estimation procedure are complex and accordingly require computationally involved techniques for the calculation of

variances, and (3) from the survey are coming thousands of statistics, many for subclasses of the population for which there are a small number of cases. Estimates of sampling error are obtained from the sample data and are themselves subject to sampling error which may be large when the number of cases in a cell is small or even occasionally when the number of cases is substantial.

Estimates of approximate sampling variability for selected statistics used in this report are presented in the detailed tables. These estimates have been prepared by a replication technique which yields overall variability through observation of variability among random subsamples of the total sample. The method reflects both "pure" sampling variance and a part of the measurement variance.

In accordance with usual practice, the interval estimate for any statistic may be considered the range within one standard error of the tabulated statistic with 68-percent confidence, or the range within two standard errors of the tabulated statistic with 95-percent confidence. The latter is used as the level of significance in this report.

An approximation of the standard error of a difference $d = x - y$ of two statistics x and y is given in the formula

$$S_d = (S_x^2 + S_y^2)^{1/2}$$

where S_x and S_y are the sampling errors, respectively of x and y, shown in the respective detailed tables.

Small Categories

In some tables, magnitudes are shown for cells for which the sample size is so small that the sampling error may be several times as great as the statistic itself. Obviously, in such instances, the statistic has no meaning in itself except to indicate that the true quantity is small. Such numbers, if shown, have been included in the belief that they may help to convey an impression of the overall story of the table.

APPENDIX II

RECORDING AND HISTORY FORMS

A. Child's Medical History—Parent

DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
NATIONAL HEALTH SURVEY

HES-256

(1-5) _____

CHILD'S MEDICAL HISTORY - Parent

NAME OF CHILD *(Last, First, Middle)* (6-11)	SEGMENT	SERIAL	COL. NO.

43. DOES YOUR CHILD HAVE ANY TROUBLE HEARING?
1 ☐ Yes 2 ☐ No 3 ☐ Don't know

44. DOES HE(SHE) EVER HAVE EARACHES?
(34) 1 ☐ Yes 2 ☐ No 3 ☐ Don't know

45. HAS YOUR CHILD EVER HAD ANY INJURY OR DAMAGE TO HIS(HER) EARS?
(35) 1 ☐ Yes 2 ☐ No 3 ☐ Don't know
IF YES, in what way was his(her) ear injured? _____

46. HAS HE(SHE) EVER HAD HIS(HER) EAR DRUMS OPENED OR LANCED?
1 ☐ Yes 2 ☐ No 3 ☐ Don't know
IF YES, how many times?
1 ☐ Once only 2 ☐ Twice only 3 ☐ Three times or more

47. HAS HE(SHE) EVER HAD ANY OTHER KIND OF OPERATION ON THE EARS?
(38) 1 ☐ Yes 2 ☐ No 3 ☐ Don't know
IF YES, what was it for? _____

48. HAS THIS CHILD EVER HAD A RUNNING EAR OR ANY DISCHARGE FROM HIS EARS (Not counting wax in the
(39) ears)? 1 ☐ Yes 2 ☐ No 3 ☐ Don't know
IF YES:
A. How often has he(she) had this?
1 ☐ Once only 2 ☐ Twice only 3 ☐ Three or more times 4 ☐ Don't know
B. Was this his(her) left ear, right ear, or both ears?
1 ☐ Left 2 ☐ Right 3 ☐ Both 4 ☐ Don't know

49. HAS HE(SHE) EVER HAD ANY OTHER KIND OF TROUBLE WITH HIS(HER) EARS?
1 ☐ Yes 2 ☐ No 3 ☐ Don't know
IF YES, what kind of trouble? _____

B. Recording Form for ENT Examination

HEALTH EXAMINATION SURVEY—II

ENT EXAMINATION

CARD 09-1

EXTERNAL EAR

R ☐ L ☐ 1 No findings

☐ (6) ☐ (7) 2 Findings →

PINNA
R ☐ L ☐ 1 Congenital
☐ (8) ☐ (9) 2 Acquired (Describe)

AURICULAR REGION
R ☐ L ☐ 1 Posterior
☐ (10) ☐ (11) 2 Anterior
R ☐ L ☐ Adenopathy
R ☐ L ☐ Operative scar
R ☐ L ☐ Fistula

AUDITORY CANAL

R ☐ L ☐ 1 No findings

☐ (12) ☐ (13) 2 Findings →

OCCLUDED
R ☐ L ☐ 1 Partially
☐ (14) ☐ (15) 2 Completely

OCCLUDED BY:
R ☐ L ☐ Cerumen
R ☐ L ☐ Foreign body
R ☐ L ☐ Tumor
R ☐ L ☐ Polyp
R ☐ L ☐ Bony exostosis
R ☐ L ☐ Anomalous canal
R ☐ L ☐ Inflammation
R ☐ L ☐ Other (Describe)

DRUM

R ☐ L ☐ 1 No findings

☐ ☐ 2 Findings →

☐ (16) ☐ (17) 3 Not visible

R ☐ L ☐ (20) (21) 1 Dull
☐ ☐ 1 Bulging
☐ (24) ☐ (25) 2 Retracted

R ☐ L ☐ 1 Transparent
☐ (22) ☐ (23) 2 Opaque
R ☐ L ☐ 1 Red
☐ (26) ☐ (27) 2 Other discolorations

DRUM MOBILE?

R ☐ L ☐ 1 Yes

☐ ☐ 2 No

☐ (18) ☐ (19) 3 Pneumatic otoscopy unsatisfactory

PERFORATED:
☐ ☐ 1 With discharge
☐ (28) ☐ (29) 2 Without discharge
☐ (30) ☐ (31) 1 Scars

R ☐ L ☐ Cholesteatomata
R ☐ L ☐ Tumor (Middle ear)
R ☐ L ☐ Other ----------

E.N.T. 1

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SAMPLE NO. (1-5)

69

HEALTH EXAMINATION SURVEY—II

ENT EXAMINATION

CARD 09-2

TONSILS

- ☐ 1 Removed completely
- ☐ 2 Tonsillar tags present
- ☐ 3 Tonsils present—Grade I (Within tonsillar pillars)
- ☐ 4 Tonsils present—Grade II (Outside tonsillar pillars but not meeting in midline)
- ☐ 5 Tonsils present—Grade III (Meeting in midline)

(32)

ORAL PHARYNX

☐ 1 No findings

☐ 2 Findings (33) →

CLEFT PALATE

☐ 1 Repaired

☐ 2 Unrepaired (34)

☐ 1 Hypertrophic lymphoid tissue on post. pharyng. wall (35)

☐ 1 Heavy postnasal discharge (36)

☐ 1 Other ---------- (37)

NOSE

R L

☐ ☐ 1 No findings

☐ ☐ 2 Findings (38) (39) →

R L

☐ ☐ 1 Deviated septum (40) (41)

R L

☐ ☐ 1 Hypertrophied turbinates (42) (43)

R L

☐ ☐ 1 Polyps (44) (45)

R L

☐ ☐ 1 Obstruction (46) (47)

☐ 1 Profuse discharge (48)

☐ 1 Swollen tissue (49)

Mouth breathing

- ☐ 1 Acute
- ☐ 2 Chronic

(50)

☐ 1 Other ---------- (51)

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2-64

SAMPLE NO.

. 73

APPENDIX III

STANDARDS FOR REFERENCE (AUDIOMETRIC) ZERO

The sound pressure standards for "normal" auditory threshold—the 1951 American Standards Association audiometric zero—maintained by the National Bureau of Standards were derived from data of the National Health Survey of 1935-36, as described previously. The original measurements were determinations of voltages applied at the terminals of the audiometer earphones used in the survey for a subgroup of persons with "normal" hearing. These threshold data were transferred by loudness balancing to a group of standard earphones designed especially for stability in calibration—the Western Electric 705-A. After loudness balancing, the earphones were placed on an NBS 9-A standard calibrating coupler and their response was measured.

Later, and in a similar fashion, the National Bureau of Standards transferred the threshold from the Western Electric 705-A earphone to five other types of earphones.

The threshold standards in terms of sound pressure in a standard coupler will be valid for the earphones of these types, provided the earphone cushions are of controlled profile, thickness, and compliance; the distance from the front of the face of the moving diaphragm to the plane of the cushion is held constant; and the earphone is held against the ear with a constant coupling force.[9,10] They will not apply to earphones of other types.

The transfer characteristics for the TDH-39 earphones used in this survey were determined through a scientifically designed and carefully controlled study on 12 human subjects done for the National Center for Health Statistics at the Acoustics Laboratory of the University of Pittsburgh.[11]

The new (1964) standard reference zero recommended by the International Organization for Standardization (ISO)[12-17] was adopted in 1969 by the American National Standards Institute after completion of this survey to replace the differing 1951 American and the 1954 British Standards.[18] Since these new standards are appearing in many of the journals and other technical publications, the comparison of them with the 1951 American Standard on the 705-A earphones and the TDH-39 earphones used in the survey is shown in table I.

The thresholds for the 1951 American Standard and the recommended ISO Standard on the 705-A earphones are rounded to the nearest 0.5 dB in accordance with the ISO method of presentation. The TDH-39 thresholds are retained in the form used to convert the findings from this survey to decibels re 0.0002 dyne per square centimeter for comparison with findings from other studies in which different instruments were used.

Table I. Comparison of 1951 American Standard and the recommended ISO Standard for reference zero

Frequency	1951 American Standard for reference zero of:		Recommended ISO Standard for reference zero of WE-705-A earphones[1]
	WE-705-A earphones[1]	TDH-39 earphones[1]	
	Decibels re 0.0002 dyne per square cm.		
250 cps	39.6	45.4	24.5
500 cps	25.0	30.0	11.0
1000 cps	16.5	22.6	6.5
2000 cps	17.0	21.8	8.5
3000 cps	[2] 16.0	26.7	7.5
4000 cps	15.0	16.9	9.0
6000 cps	[2] 17.5	23.9	8.0
8000 cps	20.9	26.5	9.5

[1] On NBS 9-A coupler. TDH-39 earphone reference values shown here are those determined for the Health Examination Survey instruments at the University of Pittsburg.[11] The other two sets were determined by averaging many different determinations from the National Bureau of Standards.

[2] Estimated.

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